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## SOME JUDGMENTS ON THE SIZE OF FAMILIAR OBJECTS.

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Many curious errors in the reproduction of one magnitude in terms of another have long been known. How many city folks can tell in feet and inches the height of an average horse? How certainly the non-professional individual, who can estimate this object closely, will measure the height on himself! The weight of a carriage, the number of sheep, hogs or cattle in a drove, the height of a tree or a steeple, the apparent size of the moon; in all these problems the personal variation would probably be great, and of course would be much greater if the estimate were made on a memory image instead of from an immediate perception. How many persons who have seen the original of the Sistine Madonna can tell with much confidence whether the virgin is "life size"; or better, whether the figure is of average size, or is larger or smaller than the average woman? In nearly all the above cases the individual variations would tend to balance each other, so that a very great constant error would not be looked for.

In many familiar instances the constant error is considerable, as, for example, in attempting to indicate on the wall the distance from the floor which corresponds to the height of a silk hat, a doubling of the actual height is not infrequent. Distances of a mile or more in the city are generally underestimated and in the country overestimated; while in certain obvious cases this tendency would be increased and in other cases might be reversed.

Few persons would fail to underestimate the length of a horse's head, especially if asked to mark it off on the black-board or, as is the custom, on a barrel. Anyone unfamiliar with such instances may learn a valuable lesson in self-distrust by placing three silver dollars in a line just touching each other and then drawing away the middle dollar far enough to make the distance from it to each of the other dollars equal to the distance between the outer edges of the other two. Besides the usual explanation of illusions we have here to deal with the very uncertain factor of multiples of an unusual unit.

In these and other cases of immediate judgment of space relations, there are two quite distinct sources of error. One arises from the common illusion of space perception when the things to be compared are both present to the senses. No one ever *imagined any* illusions of the senses. So also no amount of reasoning will convince the practical, uninitiated man that his illusive perceptions are not true perceptions of real things. He must refer these stimuli to some objective standard which commands his belief, or he must neutralize the disturbing factors.

The other source of error is the neglect of uninteresting and useless details in complex presentations. The only interest we have in the height of a hat is relative to other hats. Height in inches, or as compared with that of a wall, is almost the least interesting fact regarding a hat. This knowledge is also useless. The abstraction of these commonly unused details from our memory pictures of familiar objects has been employed for illustrative purposes by psychologists of all times. As far as I know there has been no attempt at a quantitative analysis of the facts.

In connection with classes in the study of children it has been my custom for several years to spend some time in the public schools of Lincoln, Nebraska. One result of this work for the year 1893 is the data upon which this paper is based. The repetition of the exercise with successive classes in psychology supplements this material in a satisfactory manner.

I wished to know how accurately children and adults can reproduce the size of objects with which they are familiar, but which for the time are not present to the senses. A few other points were incidentally included in the investigation. In selecting objects there was encountered the difficulty of finding common things with a definite and constant size, which should be unknown in terms ordinarily used for measuring size. To ask for the dimensions of a common brick would be useless; for actual bricks differ considerably in size, and the standard size of a brick is known to many chil-

dren. Value is perhaps as loosely associated with size as any other concept, and our coins and bills are quite constant in form and dimensions. Money is also common enough to furnish a memory image to nearly all children who could be expected to give reliable results on a question involving the description of a memory picture.

I selected the following coins: dollar, half dollar, quarter dollar, dime and nickel; also the five-dollar bill. Few children have a very definite standard of length at command. Instead of asking for dimensions, the problem was to reproduce on paper the size and form of the object. The paper used was 14 x 9 inches in size. Altogether fourteen questions were given. The teachers were nearly all interested, and they aided not a little in securing honest, intelligent and prompt results.

The procedure was as follows: The pupils of a given room all worked at the same time. Each child was given a sheet of paper, and told to write his name, age and grade in the upper left-hand corner as the paper lay on the desk with the long side parallel to the long side of the desk. Just below his name near the left margin of the paper he was told to draw a circle the size of a silver dollar. A diagram of the paper was put on the blackboard, and the position of the dollar was indicated by a small cross. It was emphasized that size was more important than roundness. The pupils were told to correct their first attempt by erasure or by striking out parts of the curve whenever the circle seemed too large or too small. About one minute was given to this and to each of the other problems, though more time was given when desired. Just at the right of the dollar they were asked to draw a half dollar; at the right of that a quarter dollar, then a dime and a nickel. Only one problem was given at a time, yet the children were not prohibited from making corrections in the figures already drawn. (I do not think that such changes were made by more than five per cent. of the children.) The fractional coins were called for as above, and each time the number of cents was announced, so that the children could not be in doubt as to what was wanted.

After drawing the nickel the children were asked to draw a square equal in area to the sum of the areas of all the circles drawn. When necessary this was explained, and in all cases the statement was put in two or three forms. Just below the coins was drawn a figure equal in size and similar in form to a five-dollar bill (or to a one or two dollar bill). In the lower right-hand corner of the paper a circle three inches in diameter was drawn; in the lower left-hand corner a square one inch on a side, and between these an equilateral triangle

equal in area to the sum of the areas of the triangle and square. The length, width and diagonal of the paper in inches were then required. The equilateral triangle was not drawn by the children of the fourth grade.

The entire time in any one room seldom exceeded twenty minutes and never occupied less than fifteen minutes. As much personal supervision as possible was given by the teachers and myself, though, of course, without any suggestion as to the points involved in the investigation. I personally conducted the work in every room, and was assisted by the teacher in charge, and often by my pupils. All measurements of results and nearly all computations were made by myself. No results are omitted from the tables. The entire work in the schools was completed in as short a time as possible. It is not probable that any material difference in results was produced by practice or anticipation. Since I examined only two grades—the fourth and the eighth,—it was possible to complete the work in each building in one-half day. Assistance from previous information and from comparison with standards was thus reduced to a minimum. The results of the various problems are by no means of equal interest. It seems best, however, to present the facts obtained separately and in the order of the original problems. A table and summary of general conclusions may then follow.

## I.

### *Reproduction of the Size of a Silver Dollar.*

All circles were measured on two diameters parallel with the edges of the paper, unless a perceptibly better adjustment presented itself. Measurements were recorded to the nearest millimeter. But, since the two diameters were taken in immediate succession, it was possible to attain even greater accuracy by attention to compensation. This was made especially easy by the habit of measuring both diameters before recording the first.

The tables are, for the most part, self-explanatory. A few words concerning the methods of obtaining the average and the average variation may be useful. It is evident that the arithmetical mean or average of all judgments in a given class, when compared with the actual dimensions of the object, will indicate the direction and amount of the constant error. In most cases the constant error is so small that it did not seem necessary or even wise to emphasize it by separation from the average, since a larger number of experiments



might possibly have reversed it. In all cases it may easily be obtained directly from the tables.

The average variation is obtained, as usual, by subtracting each judgment from the average of all in a given class, adding the remainders without regarding algebraic signs, and dividing by the number of judgments. It is simply the average variation of separate judgments from the arithmetical mean of all judgments. The average variation is a fair measure of the relative appreciation of differences on the part of the pupils in various classes. It must not be confused with the average error, which in a somewhat similar manner measures the accuracy of judgment, but in the present investigation is less interesting.

TABLE I.  
Silver Dollar = 37.8 mm.  
FOURTH GRADE.

AGE.	No. of Persons.	MALES.		No. of Persons.	FEMALES.	
		Average.	Av. Variation.		Average.	Av. Variation.
9	46	37.2	6.2	60	36.8	5.3
10	63	38.0	5.3	63	38.0	6.0
11	35	35.8	3.9	53	38.4	5.7
12	33	37.4	5.9	28	38.5	6.0
13	19	37.9	6.0	16	36.3	7.1
Average,		37.3	5.5		37.6	6.0

EIGHTH GRADE.

13	25	37.2	3.1	41	39.2	4.0
14	31	39.5	3.4	40	38.7	4.0
15	29	38.2	3.4	47	38.3	3.1
16	21	38.9	3.7	42	39.5	4.3
Average,		38.5	3.4		38.9	3.9

YEAR. PSYCHOLOGY CLASS.

1893	22	39.3	2.9	22	39.4	4.6
1894	30	41.2	6.0	42	41.4	4.6
1895	43	38.4	4.0	37	39.5	3.5
1896	53	39.1	4.3	33	38.5	3.2
1897	64	38.9	4.0	48	39.5	3.3
Average,		39.4	4.2		39.7	3.8

Table I shows that no appreciable constant error is made by children of the fourth grade in estimating the size of a silver dollar. There is no difference in the results that can be referred to difference in age. There is, however, a distinct though slight increase in the size of the circles as made by the eighth grade children. This increase is more marked in the case of the girls. The more advanced the children, the larger the dollar seems and the greater the error is. The same conclusion is also indicated by the results from university students. Indeed the tendency is even more strongly marked, as is shown by the lower part of the table. The fourth grade children, then, make the dollar about the proper size, and a decided tendency to overestimate its size is shown by the eighth grade pupils, and still more so by advanced university students. Although this tendency is unmistakable, the constant error is, on the whole, rather insignificant in itself. In connection with other measurements it has a deeper meaning.

In the columns marked average variation we observe considerable uniformity within each class and rather large differences between the classes. As might be expected the immature pupils of the fourth grade show the greatest variations from each other. Let us ascribe this to their ignorance. We shall then have to account for the contrary results of the eighth grade and university students by the development of individuality in the university classes.

We should hardly have expected the difference between boys and girls which this table shows. Yet it will be seen that the same result holds good throughout the present investigation, that is, *girls differ from each other more than boys do in their ideas of the size of such objects as are here studied*. If this fact shall be proved true generally, it may become of considerable pedagogic importance. Of course in this connection it merely means that the girls examined were in general inferior to the boys in ability to reproduce the sizes of the objects asked for. The apparent equality of the sexes in the general averages means that the sexes have practically the same constant errors in estimating the size of a dollar.

The university students are not as well able as children of the advanced grades to estimate the size of a silver dollar. Moreover they differ more from each other than do the children of the eighth grade. Beyond a certain very elementary stage general knowledge is not power in accurately reproducing the space dimensions now under consideration. The average variations of the men for the first two years seem abnormal. I am entirely unable to account for the peculiar

results exhibited. The men of the class of '94 seem to differ from each other extremely in all these tables. This is partly due to the presence in that class of three or four *large-hearted* fellows who do and see all things in a generous way. They also raised appreciably the average size of all the figures. It is not believed that mutual influence played any part in their judgments. There happened to be also two or three women in that same class who had exalted ideas of the size of coins. If these persons had been closely associated with each other,

## II.

*Reproduction of the Size of a Silver Half Dollar.*

TABLE II.

Half Dollar = 30.6 mm.

## FOURTH GRADE.

AGE.	No. of Persons.	MALES.		No. of Persons.	FEMALES.	
		Average.	Av. Variation.		Average.	Av. Variation.
9	46	28.8	4.7	60	29.6	5.1
10	63	30.9	4.4	63	30.4	5.1
11	35	29.4	4.3	53	30.4	5.1
12	33	29.9	4.3	28	30.9	6.0
13	19	30.7	4.5	16	29.6	6.2
Average,		29.9	4.4		30.2	5.5

## EIGHTH GRADE.

13	25	30.8	2.2	41	32.0	3.2
14	31	31.5	2.7	40	31.1	3.6
15	29	30.2	3.1	47	31.0	2.9
16	21	30.1	2.7	42	32.0	3.7
Average,		30.9	2.7		31.5	3.3

## YEAR.

## PSYCHOLOGY CLASS.

1893	22	31.9	3.2	22	32.1	3.5
1894	30	33.5	4.5	42	34.1	3.5
1895	43	31.2	3.5	37	32.4	3.0
1896	53	31.9	3.5	33	31.7	3.2
1897	64	31.2	3.3	48	31.8	3.0
Average,		31.9	3.6		32.4	3.2

I should accept the result as an indication of collusion. They were not intimate, and in nearly every case were the last persons of the whole class to suspect of any unfairness. In later classes nearly as extreme judgments occur, but in all other classes such errors are proportionally fewer.

Almost exactly the same characteristics are to be observed of the half dollar that were noticed in the case of the dollar, especially the near approach of the averages to the actual size of the coin, and the smaller averages of the fourth grade pupils, in this table somewhat under the actual size. We note also the approximate equality of constant errors between the sexes, the slight difference resulting from the greater size of the circles made by the girls. As in Table I there is seen little effect due to age within the same grade, but we observe the clearly marked influence of school training in the larger differences between the lower and higher grades.

The average variation also shows the same relative results as in case of the dollar. It is, however, noticeably less, and perhaps the difference in favor of the boys in the fourth and eighth grades is even greater, though as in Table I the women of the psychology class show a smaller average variation than the men. I would call especial attention to the regularity of this average variation in case of the boys of the fourth grade. For the small number of boys and their small progress in school knowledge this regularity forms an excellent example of the presence of law and of the possibilities of such investigations.

We see in this table the same low average variation of the boys of the eighth grade, which doubtless has a constant cause. It is possible that this means, in connection with the greater variations for lower and higher grades, that, at this period of life and stage of advancement, the advantage of knowledge and experience is at a maximum, and that individuality has not yet strongly manifested itself. But we must beware of generalization from so few facts. This warning applies especially to the apparently clear indication that girls are brighter than boys, inasmuch as the effect of general training is to increase the size of the figure, and the tables show that girls regularly make larger figures than those made by boys.

### III.

#### *Reproduction of the Size of a Silver Quarter Dollar.*

In reproducing the quarter dollar the constant error almost disappears. The lower grades make the circle just a little too small and the university classes make it a little too large.

The relations of the averages to each other are almost exactly the same in kind as in Tables I and II. In amount the differences between the various classes are less than in the preced-

TABLE III.  
Quarter Dollar = 24 mm.  
FOURTH GRADE.

AGE.	No. of Persons.	MALES.		No. of Persons.	FEMALES.	
		Average.	Av. Variation.		Average.	Av. Variation.
9	46	22.5	3.3	60	23.5	3.7
10	63	23.6	3.4	63	23.6	3.6
11	35	23.1	4.1	53	23.7	4.0
12	33	22.5	3.9	28	25.3	4.5
13	19	23.3	3.0	16	23.9	4.6
Average,		23.0	3.5		24.0	4.1

EIGHTH GRADE.

13	25	23.3	2.0	41	24.7	2.4
14	31	23.4	2.5	40	23.8	2.5
15	29	23.1	2.7	47	24.4	2.3
16	21	22.9	2.9	42	24.7	3.1
Average,		23.2	2.5		24.4	2.6

YEAR. PSYCHOLOGY CLASS.

1893	22	24.2	2.2	22	25.1	2.2
1894	29	26.2	3.4	42	26.4	2.4
1895	43	23.8	2.8	37	24.6	2.3
1896	53	24.6	2.6	33	24.6	2.8
1897	64	24.4	2.7	48	24.4	2.3
Average,		24.6	2.7		25.0	2.4

ing tables. The uniformity of the several groups within each large division is broken only by the class of '94 of university students, and by both men and women of this class.

The average variation has decreased considerably, even in relation to the size of the object. The relative difference between boys and girls has also decreased, and, as in Tables I and II, the men of the psychology class show a greater average variation than the women.

## IV.

*The Dime.*

Since the two following tables of results (for the dime and nickel) show the reverse tendency, *i. e.*, an *underestimation* of the size, the question arises as to the effect of the first made circles on those coming after. It happens that the quarter was preceded and also followed by two other judgments of coins, and that those preceding were overestimated and those following were underestimated, while the quarter itself was judged about right. The discussion of this question is postponed until the evidence is all before us.

TABLE IV.

Dime = 19 mm.

FOURTH GRADE.

AGE.	No. of Persons.	MALES.		No. of Persons.	FEMALES.	
		Average.	Av. Variation.		Average.	Av. Variation.
9	46	13.8	2.3	60	14.9	2.2
10	63	14.7	2.2	63	14.6	2.3
11	35	14.9	2.5	53	15.1	2.4
12	33	14.6	2.3	28	15.3	1.9
13	19	14.3	2.1	16	14.6	2.0
Average,		14.5	2.3		14.9	2.2

## EIGHTH GRADE.

13	25	15.2	1.7	41	15.5	1.6
14	31	14.9	1.7	40	14.5	1.8
15	29	14.5	1.4	47	15.7	1.6
16	21	14.9	1.6	42	15.0	1.6
Average,		14.9	1.6		15.2	1.7

## YEAR.

## PSYCHOLOGY CLASS.

1893	22	15.0	1.8	22	15.5	1.3
1894	30	16.9	2.4	42	16.1	1.8
1895	43	15.5	1.9	37	15.3	1.4
1896	53	15.5	2.1	33	15.5	1.6
1897	64	15.6	2.0	48	15.7	1.5
Average,		15.7	2.0		15.6	1.5

In estimating the size of a dime the observers for the first time lose their bearings. The constant error here claims our immediate attention by its enormous and unexpected size. The discrepancy between the real and the represented area will provoke the speculative mind to all sorts of explanations. The first naturally to suggest itself is the fact that, beginning with a larger circle, the dollar, the others are made in relation to those preceding, and hence the later ones especially are influenced by the general law of relativity, that alongside of large objects the small seems smaller than it really is. However this may be, I have convinced myself that the tendency to make a silver ten-cent piece too small does not depend upon the presence or suggestion from the outside of a large circle. Enough experiments were made later to indicate a decided underestimation of the size of a dime without conscious reference to other coins. Nevertheless it is doubtless true that the coin series, or a part of it, is responsible for this great constant error. It is also probable that this tendency has been exaggerated in the present experiments by means of the attention given to the large circles before attempting to draw the dime. My supplementary experiments were not numerous enough to warrant a quantitative comparison.

A further *a priori* consideration may have contributed to the magnitude of the constant error, namely, the fact that a dime, though smaller than a nickel, has a greater value. Doubtless such an apparent contradiction is likely to be over influential, and as the value is clear the difference is transferred to the size. It is a double application of the principle of relativity. That is, as compared with the dollar in size the dime would be underestimated; as compared with the nickel in value and size it would also appear smaller than it really is (just as a small great man seems smaller than a small unknown man). The same processes would also tend to make the nickel larger than it would otherwise be, and I am not sure but this is the case.

In other respects Table IV shows the same peculiarities as the tables already presented. The average variation is of course smaller and is also more constant within each of the various groups. For the first time it becomes less than the constant error.

## V.

### *The Nickel.*

In trying to draw a circle the size of a nickel the children of the lower grades make nearly as large constant errors as when reproducing the size of a dime. The university stu-



dents, however, are much more accurate in this problem than they were in that of the smaller circle. In other respects Table V shows the same tendencies and characteristics as the preceding tables.

TABLE V.  
Nickel = 21 mm.  
FOURTH GRADE.

AGE.	No. of Persons.	MALES.		No. of Persons.	FEMALES.	
		Average.	Av. Variation.		Average.	Av. Variation.
9	46	16.7	2.3	60	17.2	2.7
10	63	17.3	2.3	63	17.2	2.7
11	35	17.5	2.2	53	17.2	2.4
12	33	16.8	2.0	28	17.5	2.5
13	19	16.8	2.2	16	16.8	2.7
Average,		17.0	2.2		17.2	2.6

EIGHTH GRADE.

13	24	18.1	2.2	41	18.4	1.9
14	31	18.1	2.1	40	17.5	2.2
15	29	17.6	1.9	47	18.5	2.0
16	21	18.4	1.8	42	17.5	1.9
Average,		18.1	2.0		18.0	2.0

YEAR. PSYCHOLOGY CLASS.

1893	22	18.2	2.3	22	19.1	1.9
1894	30	19.9	2.7	42	20.0	2.2
1895	43	18.4	2.6	37	18.7	1.8
1896	53	18.8	2.0	33	18.9	1.7
1897	64	19.3	2.4	48	18.9	1.8
Average,		18.9	2.4		19.1	1.9

These five tables of judgments on the size of common coins may be studied together. They show that the less advanced children make all figures smaller than those made by the more advanced persons. Within any given class age does not seem to produce as great effect as does the degree of advancement in knowledge. That is, the children of nine years in the fourth grade do not, as a rule, make circles much different from those made by children thirteen years of age in the same grade. On the other hand thirteen-year old chil-

dren of the eighth grade usually differ considerably from fourth grade children of the same age. In all cases except that of the dime as drawn by university students, the girls make larger circles than the boys. The variation of the girls is in most cases greater than that of the boys. There is a slight tendency in both sexes to overestimate the size of the larger circles, and, proportionally, a much greater tendency to underestimate the size of the small circles.

In the average variation we observe much difference between elementary and advanced students except in the results for the two smaller circles. In the estimates of the dime and nickel, scholastic knowledge seems to contribute little toward a diminution of the differences between individuals. This is especially true in regard to the nickel.

## VI.

### *Squaring the Circles.*

After finishing their circles the pupils were asked to observe them in a careful manner, and to draw a square equal in area to the sum of the areas of all the circles. It is evident that this is a different kind of problem from those they had been dealing with. No memory image is necessary for the performance of the task now under consideration. No geometrical calculation would have assisted their judgment, for they had no accurate measurements, and the time at their disposal would not admit of even a hurried estimate based on a guess at dimensions and a calculation of areas. I believe, therefore, that the judgments were, for the most part, just as I desired them to be, off-hand estimates of the areas of the several circles in terms of a square.

The nearest possible approach to a systematic calculation would be in the rapid determination of the area of each circle in square inches and the summation of these results. The representation of a given number of square inches in the form of a square would then be a simple matter. It is not probable, however, that half even of the most advanced students made use of any similar methods, while only exceptional cases in the lower grades would have found any help from indirect methods. It is safe to say that in most cases the processes were unconscious, and that the comparison seemed to be immediate between the circles and their equivalent square. The square is therefore subject to two sources of error, inasmuch as the circles may have been wrongly drawn, and the translation and summation of the circles into a square may have been wrongly done.

TABLE VI.  
Square, 54.2 mm. on a side.  
FOURTH GRADE.

AGE.	No. of Persons.	MALES.		No. of Persons.	FEMALES.	
		Average.	Av. Variation.		Average.	Av. Variation.
9	45	80.1	23.5	60	82.4	20.9
10	63	76.7	14.7	63	85.1	24.5
11	34	77.6	21.4	53	81.8	19.4
12	33	85.6	21.2	28	83.1	21.4
13	18	83.9	25.4	16	84.0	21.0
Average, Should be		80.8	21.3		83.3	21.4
		51.0			51.8	

## EIGHTH GRADE.

13	25	69.2	13.4	41	69.9	15.3
14	31	64.4	8.9	40	69.3	14.5
15	29	63.0	9.5	47	66.4	12.7
16	21	60.8	12.0	42	79.3	17.0
Average, Should be		64.4	11.0		71.2	
		52.6			53.6	14.9

## YEAR. PSYCHOLOGY CLASS.

1893	22	60.0	7.4	22	60.6	8.0
1894	30	63.7	10.2	42	70.2	11.9
1895	43	57.8	7.5	37	63.7	8.0
1896	53	58.8	8.1	33	64.1	9.1
1897	64	59.8	9.8	48	63.4	9.9
Average, Should be		60.0	8.6		64.4	9.4
		54.3			55.0	

The size of a square equivalent in area to the sum of the areas of the five coins is given at the head of the table. The size of a square equivalent to the average circles of each grade of pupils is given at the bottom of each division of the table. That is, the boys of the fourth grade should have made the square 51 mm. on a side instead of nearly 81 mm. If the circles had been made without constant error, each side of the square should have been about 54.2 mm.

The girls of the fourth grade make the largest squares (83.3 mm.). This is about two and one-half times the re-

quired area, and would be still thirty per cent. too large if we subtracted the entire average variation from the side of the average square. The boys of the fourth grade make a square but little smaller than that made by the girls.

Nearly half of the excess in the size of the square is lost in the work of the eighth grade pupils, though the difference between boys and girls is much greater than in the fourth grade. The average variation in this grade is but a little less than the constant error. There is much greater difference in the average variations of this entire table than of any other thus far considered. The problem is of course more complex, and hence individuals have greater latitude. It is rather surprising that the sub-groups within the same grade should differ so greatly from each other, especially in average variation.

The university students still further decrease the constant error until it is only about two-thirds as large as the average variation of the members of the class.

It will be noticed that the circles of the lower grades are smaller than they should be, and hence the square which would contain the actual circles before their eyes is smaller than that indicated at the top of the table. The boys of the fourth grade lose about 3 mm. on each side of the square in this manner, the girls about 2 mm. In the eighth grade the loss is smaller. The girls of this grade make the circles on the average almost exactly the right size. The undersize of the dime and nickel is made up by the overestimation of the dollar and half dollar. The university students have on the whole slightly overestimated the size of the coins, the men almost not at all, but the women have done so to an appreciable degree.

There is, after all, very little difference in the areas of the circles drawn by the several grades of students. The immense difference between the areas of the squares as drawn by fourth grade pupils and university students is due to overestimation of the circles by the lower grades—to the inability of the more immature children to square the circles. It will be thought that the children misunderstood the problem. It is true that some few may have believed, after all warning and explanation, that I desired a square which would *contain* the circles unbroken. I believe, however, that very few persons failed to grasp the problem of equivalent areas.

## VII and VIII.

### *The Size of a Five-Dollar Bill.*

Tables VII and VIII are most interesting. It was required to draw a rectangle equal in size and similar in form to a five-

dollar bill (or a one-dollar bill). This problem presented great difficulty, if we judge by results, and yet the subjects seemed to have much confidence in the accuracy of their work. The proportion in the form was well maintained throughout the papers, thus indicating clearly that the persons concerned knew what they were trying to do. We must also believe, in this case at least, that the larger size of the bill, as made by advanced students, is due chiefly to more accurate power of imaging.

The constant error is so unexpectedly large, and the difference between fourth grade pupils and university students is so great, that the factors which might account for the divergences in case of the circles will not be accepted here. The slight influence of age as compared with that of grade is seen in these two tables more clearly than I remember to have seen it elsewhere. But it may be said that this whole paper is a striking illustration of the same fact, and it is just about time for some evidence of this kind to be forthcoming, since there has been a tendency to affirm the opposite on the evidence furnished by several experimental researches. It is perhaps a fault of the psychological monograph to generalize beyond its province. It is clear that, as far as these tables show, age has little to do with accuracy of reproduction of space relations, while the degree of academic advancement has much to do with the matter. We must not conclude, however, that greater extremes of age, or other problems in space relations, would show the same kind of results. It is at least unwise to make any generalization on this point without more facts than are at present in our possession.

It seems almost incredible that over 400 children, who have had four years' training in our public schools, should, on the average, think of a dollar bill as barely half its actual size. Has instruction in drawing called away attention from magnitude in order to emphasize form? There would seem to be at least great neglect in the recognition of absolute dimensions, perhaps not unlike the well-known inability of most musicians to judge the absolute pitch of tones.

Reference to the original tables shows that only four fourth grade children out of 415 made the bill long enough, and only thirteen made it wide enough. In the eighth grade, out of 275 pupils, only six made the bill long enough, and only sixteen made it wide enough. Of 394 university students twenty-four made it long enough, and fifty-eight wide enough.

Considering the size of the constant error in Table VII, the variation among individuals is but little. In the fourth grade it amounts to less than one-third of the constant error, and decreases in the higher classes, though not nearly as fast as

TABLE VII.  
Length of Bill = 186.5 mm.  
FOURTH GRADE.

AGE.	No. of Persons.	MALES.		No. of Persons.	FEMALES.	
		Average.	Av. Variation.		Average.	Av. Variation.
9	46	120.6	19.8	60	119.5	17.1
10	63	123.6	20.5	63	122.8	17.4
11	35	123.8	16.6	53	129.6	17.4
12	33	117.2	21.6	27	129.6	16.4
13	19	119.3	18.4	16	118.3	23.8
Average,		120.9	19.4		124.0	18.4

## EIGHTH GRADE.

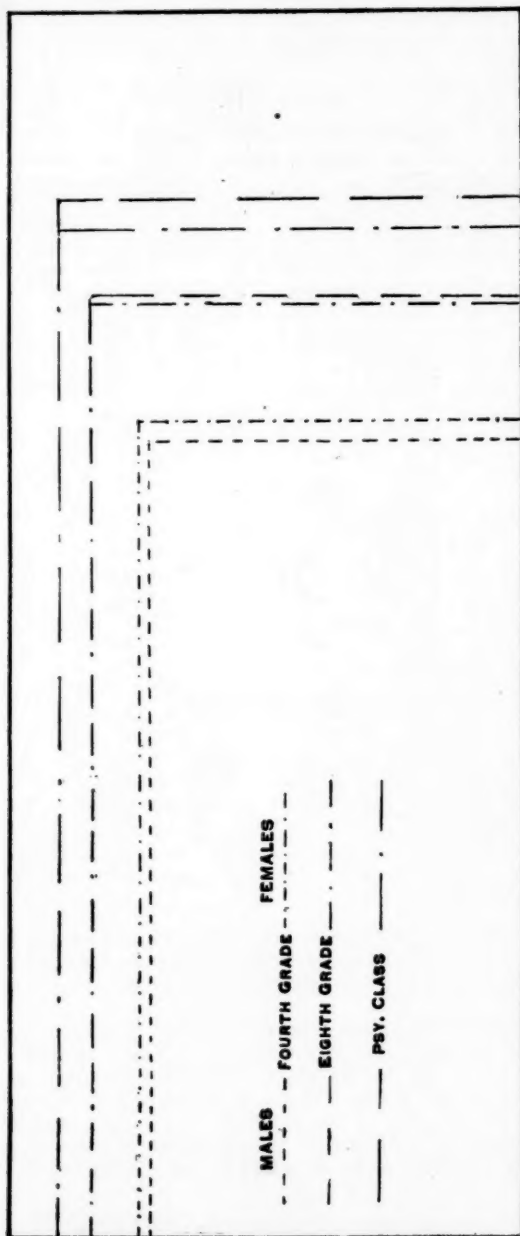
13	25	146.7	14.2	41	144.9	16.8
14	31	140.1	15.4	40	138.0	17.1
15	29	137.1	18.3	47	140.0	17.5
16	21	146.2	17.7	41	143.4	15.4
Average,		142.5	16.4		141.6	16.7

## YEAR. PSYCHOLOGY CLASS.

1893	22	153.1	14.2	22	154.6	16.4
1894	30	163.3	19.5	42	151.4	17.4
1895	43	158.4	12.9	37	147.6	16.2
1896	53	155.8	14.6	33	155.6	16.3
1897	64	156.4	15.4	48	156.2	18.5
Average,		157.4	15.3		153.1	17.0

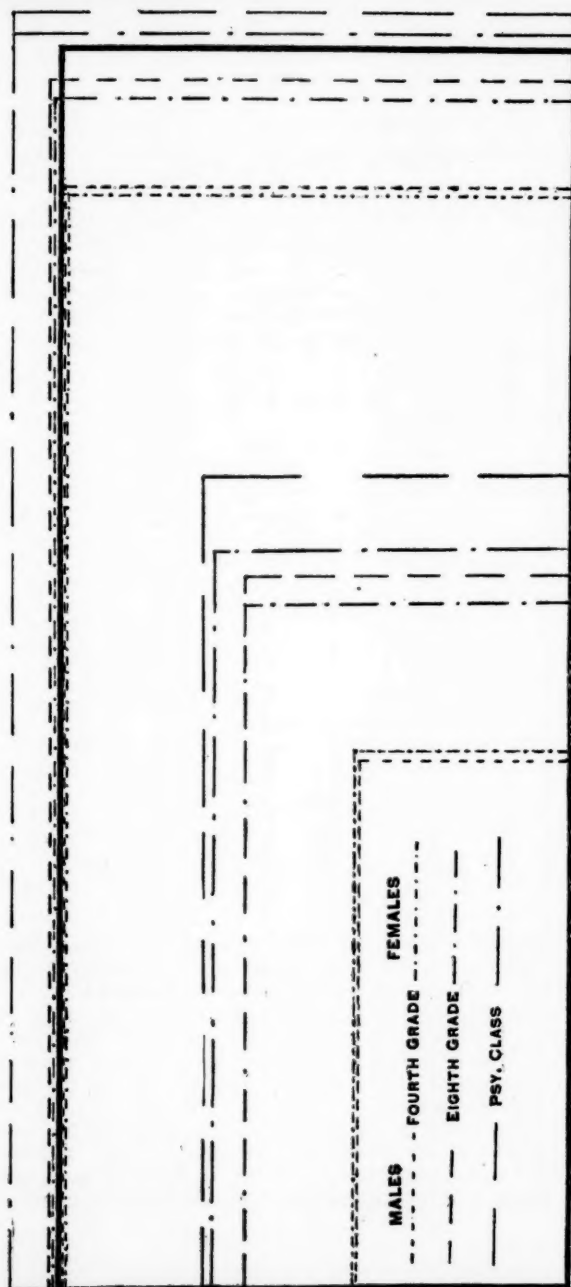
the constant error decreases. For the university students the variation is about three-fourths as large as for the fourth grade pupils, and is about one-half as large as the constant error.

The width of the bill is judged somewhat more accurately, especially by the university students. The accompanying figures indicate the nature and extent of the constant errors in both length and width. The dimensions of the bill used in these figures and also at the head of Tables VII and VIII were obtained by the actual measurement of fourteen five-dollar bills, ten two-dollar bills and ten one-dollar bills. The



Size of five-dollar bill. Average.—Heavy line indicates actual size of bill. Broken lines show the averages of all judgments in the several divisions.





Size of five-dollar bill. Maximum and minimum judgments.—Heavy line indicates actual size of bill. Broken lines show average of extreme cases. Each dimension is the average of ten per cent. of all judgments in that particular division.

TABLE VIII.  
Width of Bill = 78.5 mm.  
FOURTH GRADE.

AGE.	No. of Persons.	MALES.		No. of Persons.	FEMALES.	
		Average.	Av. Variation.		Average.	Av. Variation.
9	45	55.9	11.0	60	58.0	7.7
10	63	58.6	8.7	63	57.1	10.7
11	34	59.4	9.6	53	60.9	9.2
12	33	55.2	10.3	27	61.3	9.7
13	19	54.5	7.2	16	55.1	8.6
Average,		56.7	9.4		58.5	9.2

## EIGHTH GRADE.

13	25	65.4	6.1	41	67.2	7.1
14	31	66.9	7.7	40	64.8	6.9
15	29	62.7	6.3	47	64.7	7.6
16	21	69.0	7.6	41	66.7	5.6
Average,		66.0	6.9		65.9	6.8

## YEAR.

## PSYCHOLOGY CLASS.

1893	22	70.5	4.9	22	71.2	8.1
1894	30	73.4	9.5	42	72.8	7.1
1895	43	69.9	5.9	37	68.2	6.6
1896	53	69.0	5.6	33	69.1	5.2
1897	64	70.2	6.2	48	70.1	6.7
Average,		70.6	6.4		70.3	6.7

greatest variation in length of these bills was nine millimeters, and in width four millimeters. The bills were taken at random and the average dimension became the standard.

The explanation of so large constant errors will occur to every one. We seldom see bills spread out at full size. They are generally folded, and we observe one end as a mark of their denomination. If they were made of clay or steel we should probably exaggerate their size. Of course we are not accustomed to think of value in relation to size of bills, since all denominations are practically the same in size. The fact that the error is slightly less for the width than for the length adds to the force of this explanation. We are more accustomed

to see the width of a bill, and generally the width is seen in a way to enlarge our estimate of its size, inasmuch as it becomes the *length* of the folded bill.

I asked a few experts in banks to draw this figure and they made exceedingly small errors. One drew a rectangle 183x72 mm. When asked how he estimated the size for his drawing, he replied that he imagined it passing through his fingers. Hence with him the judgment was rather tactual than visual. Another bank teller drew the length exactly right, but over-estimated the width by ten millimeters.

TABLE IX.

Three-Inch Circle = 76.2 mm.

## FOURTH GRADE.

AGE.	No. of Persons.	MALES.		No. of Persons.	FEMALES.	
		Average.	Av. Variation.		Average.	Av. Variation.
9	44	72.3	9.8	60	70.5	14.3
10	63	79.0	12.6	63	76.5	11.6
11	34	78.2	8.5	53	75.2	10.3
12	33	79.5	10.7	28	70.4	11.8
13	19	76.8	13.9	16	70.9	15.3
Average,		77.2	11.1		72.7	12.7

## EIGHTH GRADE.

13	25	78.0	8.5	41	74.6	10.5
14	31	81.8	6.8	40	75.8	8.2
15	29	74.9	8.1	47	74.7	8.9
16	21	77.0	9.0	42	79.1	9.9
Average,		77.9	8.1		76.1	9.4

## YEAR. PSYCHOLOGY CLASS.

1893	22	76.0	9.0	22	74.5	7.1
1894	30	85.0	10.7	42	77.4	8.8
1895	43	77.0	8.5	37	79.3	6.5
1896	53	80.7	9.6	33	78.2	7.7
1897	64	78.6	9.2	48	77.7	9.4
Average,		79.5	9.4		77.4	7.9

## IX.

*A Circle Three Inches in Diameter.*

Draw a circle three inches in diameter (or three inches across), was the problem whose results are given in Table IX. The subjects were not prohibited from marking off a line as diameter, and were allowed to make corrections as usual. Perhaps nearly half used the method of a line as a guide, though I always suggested that they make the circle with freehand movement and attend to size more than to roundness.

The boys of all grades made the circles too large, but the error of the lowest grade is very small. The girls of the lowest grade made the circles too small. The higher grades make larger circles, and again the eighth grade children are more nearly right than the university students. As far as this problem alone is concerned, it would have been more satisfactory to have asked for a line three inches long. I wished, however, to use the circle for another purpose involving area, and besides, this whole investigation is on estimation of surface. While Table IX does not add much to the results of the preceding tables, it corroborates our conclusions drawn from those tables.

The variation of the girls in the fourth grade is much greater than that of the boys. In the eighth grade it is still somewhat greater, but in the university classes the girls now differ from each other less than the boys do. The subordinate groups in each division differ from each other more than in any other table except that of the square. Since this difference is not influenced by age, its cause is probably to be found in the greater difficulty of the problem.

## X.

*A Square One Inch on a Side.*

A square inch is 25.4 millimeters on a side. There is a slight tendency in all classes, except university women, to make it too large. The average of the university women is almost exactly the right size. The variation is not large, but the more advanced students differ from each other nearly as much as the elementary pupils of the fourth grade.

This problem is unlike that of the reproduction of coins. It depends upon the constructive imagination rather than upon a concrete memory image. We are accustomed to see coins as surfaces, while the square inch is, perhaps, never seen by the average person with full recognition of its name

TABLE X.

Square Inch = 25.4 mm.

## FOURTH GRADE.

AGE.	No. of Persons.	MALES.		No. of Persons.	FEMALES.	
		Average.	Av. Variation.		Average.	Av. Variation.
9	43	25.5	3.0	58	27.8	4.9
10	63	26.0	3.5	63	27.8	4.7
11	32	26.8	2.8	53	27.6	4.0
12	32	27.6	3.9	27	29.6	4.8
13	18	25.4	5.5	16	29.4	4.0
Average,		26.2	3.7		28.4	4.5

## EIGHTH GRADE.

13	25	25.6	2.4	41	27.4	3.9
14	31	26.6	2.9	40	26.6	2.7
15	29	24.4	2.4	47	27.3	3.1
16	21	26.4	3.5	42	27.4	3.6
Average,		25.8	2.8		27.2	3.3

## YEAR. PSYCHOLOGY CLASS.

1893	22	25.6	3.2	22	24.6	2.5
1894	30	27.5	4.2	42	25.8	2.8
1895	43	25.8	3.3	37	26.0	2.9
1896	53	26.6	3.9	33	25.3	3.4
1897	64	25.6	3.7	48	25.1	3.6
Average,		26.2	3.7		25.4	3.0

and with confidence in the accuracy of its dimensions. We have no article in common use which represents to us the surface of a square inch. Our visual image of this figure, then, is constructed from our memory image of a linear inch. The table shows that there is a slight constant tendency to overestimate the area of this square, and that the tendency is more decided with the lower grades, especially on the part of the girls. In all judgments of this kind, even more than in such as are represented in the first five tables, the direction of the error is a function of the mental character, and usually it may be predicted with considerable accuracy.

## XI.

*An Equilateral Triangle Equal in Area to the Three-Inch Circle and the One-Inch Square.*

This problem was not given to the children of the fourth grade, because it was not believed they would be able to understand exactly what was wanted, without more suggestion than it was thought best to give. The eighth grade and university classes tried to solve the problem, but with rather unsatisfactory results, as the table shows. Nothing particularly important was expected from this exercise. It was suggested

TABLE XI.

Equilateral Triangle = 110 mm. on a side.

EIGHTH GRADE.

AGE.	No. of Persons.	MALES.		No. of Persons.	FEMALES.	
		Average.	Av. Variation.		Average.	Av. Variation.
13	25	110.0	15.9	40	108.2	20.4
14	31	113.6	14.6	40	107.7	16.7
15	29	107.2	15.7	47	102.8	18.6
16	21	102.4	15.1	42	102.7	13.6
Average,		108.3	15.3		105.3	17.3

YEAR.

PSYCHOLOGY CLASS.

1893	22	108.4	14.1	22	103.3	9.2
1894	29	118.0	17.3	40	104.2	13.4
1895	43	110.5	17.1	37	109.8	14.3
1896	53	112.4	16.0	33	105.7	15.1
1897	64	109.2	18.4	48	107.2	16.4
Average,		111.7	16.6		106.0	13.7

by the previous problem of squaring the circles, and while the results are not as surprising as those in Table VI, they are worth noting. The constant error is insignificant, though the variation is larger than in most other tables. There is considerable uniformity in the results of both classes and of the groups in each class. It is evidently a much simpler matter to include the large circle and the small square in an equilateral triangle, than to reduce five diverse circles to the form of a square.

The average length of the three sides was taken as the

standard in order to save computation. Only in a few cases would the area differ greatly from an equilateral triangle with sides equal to the average of those drawn. The figures at the head of the table indicate the size of an equilateral triangle, which is equivalent to a three-inch circle and an inch square. The small constant errors made in drawing the circle and square must therefore be considered in calculating the constant error for the triangle.

*The Dimensions of the Paper.*

Tables XII, XIII and XIV contain the estimates on the length and width of the paper, and on the length of the diagonal. The estimates are, of course, in inches.

TABLE XII.  
Length of Paper = 14 inches.  
FOURTH GRADE.

AGE.	No. of Persons.	MALES.		No. of Persons.	FEMALES.	
		Average.	Av. Variation.		Average.	Av. Variation.
9	45	13.9	1.8	57	13.4	1.4
10	63	14.9	2.3	63	13.8	1.9
11	35	14.5	2.0	53	13.8	1.9
12	33	13.9	1.4	28	12.9	.9
13	17	14.5	1.6	16	12.7	1.6
Average,		14.3	1.8		13.3	1.5

EIGHTH GRADE.

13	25	14.1	1.0	41	14.2	1.2
14	31	13.7	1.5	40	14.1	1.4
15	28	14.5	1.3	46	13.7	1.2
16	21	13.7	1.3	42	13.6	1.4
Average,		14.0	1.3		13.9	1.3

YEAR. PSYCHOLOGY CLASS.

1893	22	15.2	1.3	22	15.1	1.3
1894	29	14.0	1.5	42	14.4	1.8
1895	43	14.7	1.2	37	14.3	1.6
1896	48	14.5	1.6	29	14.4	1.4
1897	64	13.9	.9	48	14.1	1.8
Average,		14.5	1.3		14.5	1.6



TABLE XIII.  
Width of Paper = 9 inches.  
FOURTH GRADE.

AGE.	No. of Persons.	MALES.		No. of Persons.	FEMALES.	
		Average.	Av. Variation.		Average.	Av. Variation.
9	44	8.7	1.5	55	8.6	1.2
10	61	9.2	1.6	61	8.9	1.6
11	34	8.7	1.3	53	8.7	1.4
12	33	9.5	1.5	27	8.2	1.0
13	17	9.2	1.3	16	8.2	1.5
Average,		9.1	1.4		8.5	1.3

## EIGHTH GRADE.

13	25	8.8	.9	41	9.0	.8
14	31	8.5	1.0	40	9.0	1.3
15	28	9.0	.8	46	8.8	1.0
16	21	8.5	1.1	42	8.7	1.0
Average,		8.7	1.0		8.9	1.0

## PSYCHOLOGY CLASS.

1893	22	9.8	.9	22	9.6	1.0
1894	29	9.1	1.4	42	9.4	1.2
1895	43	9.4	1.2	37	9.2	1.2
1896	48	9.5	1.2	29	9.6	1.2
1897	64	9.1	1.1	48	9.3	1.2
Average,		9.4	1.2		9.4	1.2

A slight tendency to overestimate the length is seen in all divisions except that of the fourth grade girls, who underestimate this dimension about three-quarters of an inch. The variation is the lowest we have yet found, being on the average somewhat less than ten per cent. of the estimated size of the paper. Most children in the public schools have a fair conception of the foot as a unit of length. The paper being appreciably longer than a foot would be comparatively easy to estimate. There are, however, individuals who have no conception of any unit of length, as the table of extreme cases shows (Table XV).

The width of the paper was not as accurately judged as

the length, even by the university students. I infer that the principal cause is the greater difference, both relative and absolute, between the standard—one foot—and the dimensions to be estimated. The girls of the lower class underestimate the width about as much as the students of the psychology class overestimate it.

TABLE XIV.

Diagonal of Paper = 16.6 inches.

## FOURTH GRADE.

AGE.	No. of Persons.	MALES.		No. of Persons.	FEMALES.	
		Average.	Av. Variation.		Average.	Av. Variation.
9	41	17.6	2.9	52	17.0	2.5
10	60	18.7	3.2	60	17.2	2.7
11	30	17.5	3.1	49	17.3	3.3
12	31	17.7	2.7	27	16.3	1.8
13	15	18.8	3.4	16	16.4	3.5
Average,		18.1	3.1		16.8	2.8

## EIGHTH GRADE.

13	25	17.4	1.6	38	18.0	1.8
14	29	16.9	1.6	36	17.9	2.0
15	28	18.0	2.1	46	17.7	2.2
16	21	17.1	1.6	38	17.3	2.2
Average,		17.4	1.7		17.7	2.1

## YEAR. PSYCHOLOGY CLASS.

1893	22	19.1	2.9	22	18.4	2.1
1894	29	17.4	2.5	40	18.2	2.1
1895	43	18.3	1.9	37	17.4	2.1
1896	48	17.5	1.8	28	17.9	2.1
1897	64	17.1	1.3	48	17.1	2.2
Average,		17.9	2.1		17.8	2.1

The diagonal of the paper was still more difficult to judge, partly because of its greater length and the absence of any distinct line like the edge of the paper, and partly because it differed more from the most common unit of linear measure, the foot. The actual length of the diagonal is 16.6 inches.

It is seen from the table that neither age nor academic rank aids one much in this exercise. The length of the diagonal is overestimated by nearly every division. The girls of the fourth grade, having the lowest figures here, as in the two preceding tables, have overestimated least, and hence seem to be most accurate in judgment of this dimension.

The variation naturally rises with the increased difficulty of the problem. It also differs more than usual in the various divisions of the same class of observers; as, for example, in the groups of twelve and thirteen year old girls of the fourth grade, where it varies from 1.81 to 3.47, and in the men of the university classes from 1.26 to 2.90. On the other hand the women of the university classes have the most uniform variation of any table.

## XV.

### *Maximum and Minimum Judgments.*

Some notion of the range of judgment is a necessary supplement to the foregoing exhibit. It has seemed to me best to present this in a condensed table containing a certain proportion of the judgments of each class. I have, therefore, given in Table XV the average of ten per cent. of all judgments in each class selected from the highest figures, and also the average of ten per cent. taken from the lowest figures for each problem. Table XV then gives for every hundred judgments the average of the ten highest and the average of the ten lowest. For comparison with my other tables this seems to be a better method than to give the judgment which is exceeded by ten per cent. and that which is not reached by ten per cent. of the subjects.

The table explains itself. In the fourth grade the average of the highest judgments is almost exactly twice the average of the lowest judgments. With age and learning the difference between extremes becomes less; but even with university students the average of the maximum is about one and two-thirds times the average of the minimum judgments.

The first problem of special interest in this table is the maximum size of the dime. The average of the tenth yielding the largest judgments barely exceeds the real size of the dime, while the average of the smallest judgments is almost incredibly small. Many of the children drew a dime smaller than the diameter of a common lead pencil, and only about as many made it as large as a nickel. Not one person in ten made it large enough, while almost one in ten made it only half big enough.

The most interesting problem is the five-dollar bill. The

TABLE XV.

## Maximum and Minimum Judgments.

Each number is the average of ten per cent. of the persons in that particular division.

	Size. Mm.	SEX.	4TH GRADE.		8TH GRADE.		PSY. CLASS.	
			Larg't	Small't	Larg't	Small't	Larg't	Small't
Dollar,	37.8	M	49.5	26.9	46.1	31.1	48.8	30.7
		F	52.1	24.1	48.8	31.4	49.9	31.6
Half Dollar,	30.6	M	40.3	20.7	38.0	24.2	40.0	24.5
		F	42.7	17.9	39.6	24.9	40.6	25.3
Quarter Dollar,	24	M	31.0	15.9	29.0	17.9	31.8	18.6
		F	32.8	14.5	30.8	19.2	31.2	19.5
Dime,	19	M	20.0	9.9	18.7	11.5	20.3	11.0
		F	19.7	9.7	19.1	11.6	19.5	11.8
Nickel,	21	M	22.7	12.1	21.8	13.9	24.4	13.8
		F	22.8	10.9	22.4	13.4	23.7	15.4
Square,	54.2	M	137.7	45.0	93.0	43.4	82.7	42.6
		F	133.1	43.2	114.5	42.6	94.7	45.0
Bill, long,	186.5	M	167.3	80.2	181.4	107.9	191.8	122.9
		F	165.7	81.5	178.7	103.9	188.4	111.9
Bill, wide,	78.5	M	78.1	37.3	80.1	49.5	85.5	56.0
		F	77.3	38.0	79.5	49.6	85.2	54.3
Circle, 3 in.,	76.2	M	104.1	51.3	94.4	59.7	105.1	60.5
		F	102.7	44.4	99.0	54.3	96.8	59.6
Square Inch,	25.4	M	36.7	18.2	32.7	19.8	34.9	18.6
		F	41.3	20.5	35.4	20.9	32.4	18.5
Triangle,	110	M			149.0	77.1	152.1	78.9
		F			150.2	67.8	139.2	76.8
Paper, long,	14 Inches.	M	20.7	11.3	17.3	10.9	18.0	11.6
		F	18.1	10.0	17.0	11.0	18.6	11.2
Paper, wide,	9	M	12.7	5.9	11.0	6.3	11.7	7.2
		F	12.1	5.9	11.8	6.8	12.3	7.8
Paper, diag.,	16.6	M	26.4	12.8	22.4	13.8	23.0	14.3
		F	23.7	11.4	23.4	13.7	23.3	13.8

accompanying figures illustrate the extremes and also the average judgments. In the fourth and also in the eighth

grade, the maximum judgment of length fails to reach the actual length, and even in the university classes exceeds it only a few millimeters. The minimum of the fourth grade gives us a bill scarcely longer than the width of a real bill and a width about one-fifth as great as the real is long. Hence, the average minimum bill is about one-fifth the actual bill. Remembering that all maxima and minima are each the average of ten per cent. of the judgments of the given division, the monstrosity of the results is apparent. Those who make the bill large enough are veritable freaks; while those who make it only half large enough are the normal persons.

#### SUMMARY.

From observations on nearly eleven hundred persons, the following points, among others, may fairly be said to be established:

- I. Our notions of the size of familiar objects differ widely.
- II. Young children underestimate the size of coins and bills.
- III. Mature persons of intelligence overestimate the size of the silver dollar, half dollar and quarter dollar.
- IV. All classes of persons underestimate the size of the dime, nickel and bill.
- V. Girls make larger coins than boys and also larger equivalent squares. In other problems of this investigation the boys make the larger figures.
- VI. The judgments of the eighth grade children are more uniform than those of either the fourth grade children or university students, and are more nearly like the latter than the former.
- VII. The more advanced classes produce *larger* coins and bills than the elementary classes; but within the same class age causes no appreciable effect.
- VIII. It is probable that the reproduction of such objects as are here studied, is a function of the *personality* apart from knowledge or mental acumen.
- IX. The enormous errors in reproducing the bill and dime, suggest that the teaching of drawing in public schools may profitably concern itself more with size.
- X. To young children a memory image is smaller than its object, while in the minds of adults it may exceed the object in size.

# A CONTRIBUTION TO THE STUDY OF ILLUSIONS,<sup>1</sup>

WITH SPECIAL REFERENCE TO

- (a) THE EFFECT OF SIZE UPON ESTIMATIONS OF WEIGHT,
- (b) THE EFFECT OF CONTOUR UPON ESTIMATIONS OF AREA.

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This study grew out of a general study instituted by Professor Jastrow, in 1892, for the purpose of studying the possibility of suggestibility in normal individuals. It was first directed toward a study of the creation of actual illusions of certain types. For example, an illuminated surface was made to appear to grow brighter, a space made to appear to grow larger, a sound to grow louder, or a heated tube to grow hotter, without actually becoming so.

In this connection it was important to determine how great was the actual illusion and how suggestible each of the senses might be. Some results from this line of research may be found embodied in a thesis on "A Study of Sensibility with Special Reference to Suggestion," prepared by Messrs. G. M. McGregor and B. R. Shurly, and deposited in the library of the University of Wisconsin.

As a further contribution, it was deemed important to make a study of certain relations of sense perceptions to each other, which would lead to a quantitative determination of the influence one sense may have in acting as a suggestive factor over another.

This study grew out of the former study, and was outlined when the announcement of Dr. Gilbert's article was first made and when a description of Seashore's "Suggestion Blocks" was given in Willyoung's catalogue of supplies. Hence, to make the results conformable, the same size of blocks was determined upon for this study. The methods of experimentation, however, were unknown at the time and

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<sup>1</sup>A minor thesis submitted as a partial requirement for the degree of Master of Science in Pedagogy, University of Wisconsin, 1896.

consequently the methods are only partially coincident. Since the experiments were begun (just before commencing the tabulation of results), a very thorough and exhaustive study was published by Dr. Seashore under the title "Measurements of Illusions and Hallucinations of Normal Life" (*Studies from Yale Psychological Laboratory*, Vol. III, 1895). Another treatment of the same subject from a little different standpoint in the previously mentioned article by Dr. Gilbert preceded Dr. Seashore's article. (See *Yale Studies*, Vol. II, 1894, article, "Researches on the Mental and Physical Development of School Children.") The latter's subjects were children, while Dr. Seashore's and those herein considered were adults, mainly from college classes. Hence, the following contribution will be for the first part mainly corroborative of what has already received fairly adequate treatment.<sup>1</sup> A few variations in method and in results will be noted. The second part deals with a problem heretofore unworked.

## PART I.

### *Apparatus.*

Two sets of cylindrical discs, 31 mm. long, were made of wood which was painted black so as to represent a uniform surface. The first set (*U*) consisted of 17 discs 31 mm. long, and having a uniform diameter of 60 mm., but of weights varying by 5 g. each in a constant arithmetical progression. The lightest was 20 g. and the heaviest 85 g. in weight. The second set (*V*) consisted of 13 discs so made as to have a constant weight of 55 g. each, but varying in diameter by a regular increment of 0.1. The set contained the following sizes:

29.28 mm.	47.15 mm.	69.04 mm.
32.21 "	51.87 "	75.94 "
35.43 "	57.06 "	83.54 "
38.97 "	62.76 "	91.89 "
42.87 "		

<sup>1</sup> In this connection mention should be made of Dr. F. B. Dresslar's contribution in the "Studies in the Psychology of Touch," this JOURNAL, VI, June, 1894. One part of the study deals with the illusions of weight produced by size. His weights were of constant diameter, but of varying heights.



These are essentially the same as Seashore's "B."

Two racks, resembling the keyboard of a piano, were made containing a set of 18 levers or keys about 200 mm. in length, placed side by side and balanced in the middle upon a brass rod, which served as a fulcrum for all. Glass bearings were provided to reduce the friction to the minimum. On one end of each lever a mortise was made to hold the respective discs. A point was found on the opposite end of each lever, where a pressure just equal to the weight on the other would just balance the weight. On this spot a rubber button was fastened to indicate the point. Each of the racks was provided with a movable screen so that in the first experiment in each series the observers had no knowledge of the size, shape, or other qualities of the discs.

#### EXP. I, SERIES I. SET "U."

##### *Lever pressure method. Discs screened from view.*

With the discs (*U*) screened from view the observer was asked to seat himself by the side of the rack, and by pressing upon the buttons on the keys, to select a weight just equal to the one on a certain key which contained the standards. The subjects were informed that the discs formed a weight series, and were also told the direction of the series.

For standards I used five discs, three of which were 60 mm. in diameter and weighed 35 g., 50 g. and 65 g. respectively; the other two weighed 55 g. each, but one ("1") was 90 mm., and the other ("s") 30 mm. in diameter. The only instructions given to the observers were that by first testing the standard, they should select, with the same hand and same finger, a weight just equal to the standard. Each one was at liberty to refer alternately to the standard as many times as he chose. However, if too many trials were made the subject was cautioned against fatigue. Usually the judgments were the best if only two or three repetitions were made with the standard and the one thought to be about right. If more trials were made, the subject frequently abandoned the first one and selected one not so nearly correct. In such cases a second trial was given later on.

The standards were presented in an irregular order, and were removed each time, so that the observers did not know throughout the whole series that they had tested the same one more than once. Each of the twenty-five observers was given two trials with each standard.

The first experiment was made with the discs screened from view, so as to be assured that no illusion could possibly arise

in that way, and to show that the selections were not mere chance guesses. Incidentally, it was a test of the accuracy of selection of equal weights by the lever pressure method. The results of the averages of 50 trials with each standard are as follows:

TABLE I.  
*Uniform series. Lever pressure. Screen.*

Standards.		Average weight of disc selected.	Average variation.	Diameter of Series.
Diameter.	Weight.			
60 mm.	35 g.	29.02 g.	6.95 g.	60 mm.
60 "	50 "	38.05 "	12.6 "	60 "
60 "	65 "	52.17 "	13.48 "	60 "
"l" 90 "	55 "	47.39 "	10.5 "	60 "
"s" 30 "	55 "	47.60 "	9.8 "	60 "

("l" indicates the disc 90 mm. in diameter and "s" the one 30 mm. in diameter, throughout the discussion.)

From the table we see that all the average selections are brought within a range of 10% of each other. The table shows in the first three lines that in comparing by the muscle pressure method, when selecting from the series in exactly the same manner as the standard is tested, there is a decided tendency to choose too small a weight. This is true of all three weights and the decisions are uniformly in one direction. Of the 150 judgments there were only seven in the opposite direction, *i. e.*, only seven were selections greater than the standards. These seven answers were confined to five persons; hence, we have over 80% of the subjects and 95% of the answers in partial concord concerning this tendency.

The three discs were underestimated by about 6 g., 12 g., and 13 g. respectively. This result does not at all agree with Dr. Seashore's. He finds when the weights were concealed from view there was no tendency to underestimation or exaggeration, and further that the difference between the standard and the ones selected never exceeds 2 grams on the average.<sup>1</sup>

We find further that the large disc "l" and the small one

<sup>1</sup> See p. 10, Table IV, Seashore's article. His method, however, was different.

"s" are underestimated, although not seen, and in about the same proportion as the other three. It is noticeable that "l" and "s" have selections made for them which are equal to each other, and also that the average variation for these two are practically the same. This shows that chance has not determined the answers, and that the same tendencies are operative, whatever the size or shape of the objects, when not seen. The cause of the tendency to underestimation is at present unexplainable.

### EXP. 2, SERIES I.

#### *Lever pressure—Set "U." Discs in sight.*

With the screen removed from the rack the observer was requested to select in the same manner as before discs that were equal in weight to each of the standards. Thus, in this experiment, the muscle pressure method was used, but was aided by sight. Each of the five standards was given twice to the 25 observers, making 50 experiments with each standard. The object of this test was to determine quantitatively how great an influence, if any, sight has upon judgments relating to weight. In other words, to determine whether sight acts as a suggestive factor in producing illusions of weight. In this experiment the following tabulated results were obtained:

TABLE II.  
*Uniform Series—Lever pressure—In sight.*

Standards.		Average weight of disc selected.	Average varia- tion.	Diameter of series.
Diameter.	Weight.			
60 mm.	35 g.	28.3 g.	8.0 g.	60 mm.
60 "	50 "	38.5 "	12.4 "	60 "
60 "	65 "	50.7 "	14.3 "	60 "
90 "	55 "	43.1 "	12.4 "	60 "
30 "	55 "	51.8 "	7.3 "	60 "

It will be noted that for the first three used as standards the results are almost identical with those of the first three in Table I. This agreement is as we should expect, since these three standards are of the same size, shape, color, and in every visible way exactly like those selected from. We find

again the same strong tendency to underestimation that was observable in Table I. There is a deviation, however, in case of "l" and "s." For "l" the selection in the previous table was 4.2 g. *larger*, and for "s" the selection was 4.2 g. *smaller* than in the second table. These results show that as soon as sight of the objects comes in to assist in selecting equal weights by the lever pressure method, the tendency to underestimation is reduced, especially in case standards, of unusual density (great or small) are used. However, for the first three there is no appreciable deviation either way.

With the 35 gram standard, four made overestimations; with the 50 g. standard, two made overestimations; with the 65 g. standard there were none; with "l," two; and with "s," eleven who made overestimations. This shows that size acts somewhat as a factor in determining weight, and that illusions tend to be produced by unusually great or small density. The amount of suggestion in grams varies inversely as the increased or diminished diameter of the standard discs. That is, "l" is 30 mm. *greater* in diameter than the series, and the *additional* 30 mm. diameter produces a *decrement* of 4.2 g. in weight; while "s," which is 30 mm. *smaller* than the standards, produces an *increment* of 4.2 g. in weight. From this experiment we conclude from all five lines that: 1. Objects when compared by the lever pressure method are underestimated, even with the additional aid of sight. 2. A variation in density of the objects tends to increase or diminish this tendency. 3. Objects of similarly appearing material, but of different density, appear to differ in weight when compared. 4. The larger induce a decrement of estimated weight; the smaller induce an increment of estimated weight. 5. The intensity of this illusion varies in a direct sense as the amount of difference in diameter between the discs compared.<sup>1</sup> 6. This verifies Weber's law that proportional increments are perceived as equal increments. (Provided we mean diameters.) In the above experiments the diameters were to each other as 3 : 6 : 9, and the increments of weight were perceived as equal.

#### EXP. 3, SERIES I.

*Set "U." Discs in sight. Lifted between thumb and finger.*

The next step was to compare the weights by active lifting or "hefting." The most accurate sense of weight is obtained in this way, because we have the additional aid of the tactile

<sup>1</sup> See Seashore's article, p. 5. He says "directly as the diff. of size." He probably means *diam.*

sense. Of greater importance, also, are the joint sensations which come into play and give added data for judgment. Through long practice in this manner of estimating weight we have become able to make finer discriminations of weight than when any of these factors are omitted.

In this experiment a piece of wood the length of the rack and gouged out, served as a trough, in which the blocks were placed so that the standard discs might be moved into position whereby the same angle of hand and arm could be maintained. The observer was required to grasp the two ends of the discs between the thumb and either fore-finger or middle finger. Therefore, in all cases, the same span, grip and tactile sensations were preserved. Had the observer been allowed to grasp the discs around the circumference, an additional aid in determining volume would have been gained. But the aim was to have the perception of size depend entirely upon sight, as in experiment 2. The results obtained are given in the subjoined table.

TABLE III.

*Set "U"—In sight—Active lifting.*

Standards.		Average weight of disc selected.	Average varia- tion.	Diameter of series "U."
Diameter.	Weight.			
60 mm.	35 g.	35.5 g.	2.1 g.	60 mm.
60 "	50 "	49.1 "	4.5 "	60 "
60 "	65 "	62.8 "	3.1 "	60 "
90 "	55 "	40.3 "	(—)14.7 "	60 "
30 "	55 "	69.5 "	(+)14.5 "	60 "

In this set of experiments the results of the comparison of the first three standards show no illusion, as they ought not, the size being the same as the discs compared. The only difference between these results and those corresponding in Tables I and II are that in Table III the average weights of the discs selected are much nearer to the standards. This is due to the additional factor mentioned above which is promotive of accuracy. In the first case we find that the average of the estimates is a trifle greater than the standard. The second and third are very much nearer the standards than before, but still underestimated. The average errors are in all three

cases very small, which shows the constant direction of the answers. The illusion produced by the discrepancy between size and expected weight comes out very strongly in case of "l" and "s." Between "l" and the one selected there is a difference of  $-14.2$  g., while between the smaller one, "s," and the one selected there is a difference of  $+14.5$  g. The average errors, of course, coincide with the actual differences, since all *underestimated* in selecting one equal to "l" and *overestimated* in selecting one to equal "s." The deviations from "l" and "s" are numerically equal, but opposite in sign. As in experiment 2, the standards vary from the normal, or from the series, by 30 mm. each in diameter and in opposite directions from the series. We may conclude from this that the same law as was stated in discussing experiment 2 holds true, viz.: that the intensity of the illusion varies in a direct sense as the amount of difference in diameter between the discs compared. In fact, all the laws governing the operations in experiment 2 hold true in this one. The only differences are that by the last method actual weights are more accurately perceived when size is not a modifying factor; and when an illusion is produced by differences in density, the illusion is much stronger by lifting than by the lever pressure method.

#### SERIES II.

In the second series of experiments with the same five standards, three sets of experiments were performed. But in this series the set "V" (variable in size) was used to select from. So that in this series we had three standards of equal diameter and two of varying diameter, also a varying set, from which to select. This increase of variable factors rendered the problem a more complex one than the preceding. Bearing in mind that all were 55 g. in weight, and varying in diameter by a regular increment of 0.1, we pass to—

#### EXP. 1, SERIES II.

##### *Set "V"—Lever pressure—Screen.*

With the discs screened from view of the observers, they were asked to select a disc equal in weight to the standards presented. This time they were uninformed concerning any of the properties of the series. In the same manner by pressure upon the keys, and in the same number of experiments as in each one of the preceding series, the following results were obtained:

TABLE IV.

*Set "V"—Lever pressure—Screened.*

Size of series variable by increment of one-tenth from 29.28 mm. to 91.89 mm.  
Weight 55 g.

Standards.		Average diameter of disc selected.	Difference between average and standard.
Diameter.	Weight.		
60 mm.	35 g.	49.2 mm.	-10.8 mm.
60 "	50 "	53.2 "	- 6.8 "
60 "	65 "	39.1 "	-20.9 "
90 "	55 "	48.4 "	-41.6 "
30 "	55 "	45.4 "	+15.4 "

No regularity can be detected in the results, which indicates that they are purely chance answers. Some thought that the discs were arranged in a series running one way, and about as many thought the series ran in an opposite direction. Others thought they were arranged in an irregular order. Twelve of the observers detected that the standard 35 g. was lighter than any in the series. Few expressed any certainty, a large number doubt concerning their answers to this one. Only one asserted that the entire series was lighter than the standard 65 g., yet a number said they did not feel very sure concerning their selection. That a larger one should be selected to correspond to "l" than for "s" is purely accidental. In many cases I asked the subject to compare "l" and "s," he not seeing them, and invariably they were said to be the same. At the conclusion of all the experiments the two were compared by lifting and in sight. In this case they always declared that "s" was twice as heavy as "l," some said three times as heavy, and could hardly be convinced when the two were placed on the scale-pans of a balance at the conclusion of the experiments, and shown to be equal.

The remarkable point in these results is that, although the entire series consisted of blocks weighing 55 g. each, while three of the standards were 35 g., 50 g. and 65 g. in weight, in a large majority of trials (80%), a disc was found which seemed to correspond. This shows that the threshold of discrimination for this sense is very wide.



## EXP. 2, SERIES II.

*Variable size—In sight—Lever pressure.*

The screen was then removed and the observer asked to select one equal to each of the standards again. The observers all very soon said that the discs of smallest diameter were heaviest. The average results are given in the following table:

TABLE V.

*Set "V"—In sight—Lever pressure.*

Diameter of series variable by increment of one-tenth from 29.2 mm. to 91.59 mm.  
Weight 55 g.

Standards.		Average diameter of disc selected.	Difference between average and standard.
Diameter.	Weight.		
60 mm.	35 g.	81.4 mm.	+ 2.14 mm.
60 "	50 "	63.9 "	+ 3.9 "
60 "	65 "	46.9 "	-13.1 "
90 "	55 "	74.1 "	-15.9 "
30 "	55 "	37.8 "	+ 7.8 "

In the first three cases where the standards vary by a regular increment in weight, the discs selected vary by a quite regular decrement of diameter. In the last two there appears a great difference between the selections to correspond to "l" and "s." The one has just twice the diameter of the other. This comes from the double factors producing the illusion. In the other series with variable standards and uniform discs to select from, the illusion is not so great.

## EXP. 3, SERIES II.

*Set "V"—In sight—Lifted between thumb and finger.*

The concluding experiment of the weight tests was made by having the discs lifted between thumb and finger, and alternating the standards with those from which the selections were made. In this test, where greater accuracy in selection is possible, that ought to be observable in the results. Again, if the same law is followed that held in Series I, where there are illusions they ought to be more striking in this table than in Table V.



TABLE VI.

*Set "V"—In sight—Active lifting.*

Diameter of series. Vary by a regular increment of one-tenth from 29.2 mm. to 91.89 mm. Weight 55 g.

Standards.		Average diameter of disc selected.	Difference between standards and selection.
Diameter.	Weight.		
60 mm.	35 g.	86.1 mm.	+ 2.61 mm.
60 "	50 "	73.8 "	+13.8 "
60 "	65 "	48.8 "	-11.2 "
90 "	55 "	86.7 "	- 3.3 "
30 "	55 "	33.8 "	+ 3.8 "

From this experiment we are led to believe that the illusion comes out most strongly when testing in the manner in which we can ordinarily judge most accurately. In the first three cases the increment of weight is the same as in the previous experiment, but the decrement of diameter is much greater.

Although "l" and "s" each weighs 55 g., one of nearly three times as great a diameter is selected for "l" as for "s." In other words, with the standards of the same weight as the series to select from, there are selected those of about the same size as the standards themselves. That is, the same effect as was discovered in Table V is here noticeable, but considerably emphasized.

*Résumé.*

The main points of the study are these: When we study the effect of selecting from a series of blocks of uniform size, but differing in weight, those that are equal to certain standards, which differ in size (*i. e.*, in density) from the series, we are studying the effect of size upon weight.

On the other hand, when we select out of a series of variable size and variable density, but uniform in weight, the equal of standards that differ in weight, but uniform in size, the question becomes one of the influence of weight upon size.

From the results obtained it appears (1) that the effect of the latter is more marked than the former; (2) the illusions are more striking when the objects are lifted between thumb and finger than when raised by the lever-pressure method; (3) in the lever-pressure method of estimation, the illusion

does not appear in Series I at all, being overbalanced by the constant tendency to underestimate the selected weights; (4) with the lever-pressure method there is a very marked but unaccountable tendency to select a lighter weight as the equivalent of given standards; (5) in the lifting method there is no such exaggerated tendency, and the error is remarkably small; (6) these results agree in general with Dr. Seashore's (except when the lever-pressure method is used, and also with weights of uniform size), but the degree of corroboration cannot well be calculated because of the disparity of methods of experimentation.

## PART II.

### *Study of the Effect of Contour upon Area.<sup>1</sup>*

The second part of this study deals with an examination of the possible influence that the contour of a surface may exert upon the judgment of its area. Figures of equal area but of different shapes have consequently different amounts of contour. This study was instituted to determine whether the amount or direction of the contour would prove a factor in influencing the judgment of the area. In other words, does any illusion of area ensue when the contour of a given surface is modified?

#### *Apparatus.*

In studying the effect of contour upon judging areas, the following apparatus was used: (a) A set of twenty-one squares, varying in size by a regular increment of 0.025 in area, was made from paper of a dead black color; (b) a set of twenty-one circles made of the same material and of the same areas as the squares, and varying by the same increment. Each of the figures had a white margin (of the card-board on which the black paper was pasted) of 20 mm. on each of two sides and 10 mm. on the other two sides. (For sizes see Table VII.) (c) An instrument was devised whereby a square aperture could be enlarged or contracted, still maintaining the horizontal and perpendicular direction of the sides, and also maintaining perfect right angles. The opening was changed by means of a crank, which wound up a cord attached to the movable sides of the square. A black surface, similar to the paper squares, was revealed each time by the movable sides, which were white. A millimeter scale enabled me to read at a glance the size of the square selected.

<sup>1</sup>Dr. Dresslar has also made some study of the influence of contour upon estimation of weight. This JOURNAL, VI, 3, p. 360.

## EXP. 1, SERIES III.

*Figures in Terms of Squares—Display Board.*

The squares were lettered in order of size, and arranged upon a display board, which was simply a board, 3 ft. x 4 ft., covered with black felt cloth. The subject was seated about two meters from the board and asked to select a square from

TABLE VII.

*Dimensions of Series of Squares and Circles.*

Area of Figure.	Side of Square.	Radius of Circle.
7,818.86 sq. mm.	88.4 mm.	50.0 mm.
7,921.00 "	89.0 "	50.5 "
8,209.66 "	90.6 "	51.1 "
8,372.25 "	91.5 "	51.8 "
8,628.43 "	92.9 "	52.4 "
<sup>1</sup> 8,836.00 "	94.0 "	53.0 "
9,070.35 "	95.25 "	53.7 "
9,312.25 "	96.5 "	54.4 "
9,523.85 "	97.5 "	55.1 "
9,741.75 "	98.75 "	55.8 "
<sup>1</sup> 10,000.00 "	100.00 "	56.4 "
10,225.00 "	101.25 "	57.1 "
10,500.00 "	102.47 "	57.8 "
10,684.00 "	103.75 "	58.5 "
11,025.00 "	105.00 "	59.2 "
<sup>1</sup> 11,289.06 "	106.25 "	59.9 "
11,576.25 "	107.60 "	60.6 "
11,881.00 "	109.00 "	61.3 "
12,155.06 "	110.25 "	62.1 "
12,387.00 "	111.60 "	62.8 "
17,762.81 "	112.98 "	63.5 "

For standards the following figures were used :

TABLE VIII.

*Dimensions of Standards.*

Area of Standards.	Contour of Triangle.	Contour of Oblong.	Contour of Square.	Contour of Hexagon.	Contour of Circle.
8,836.00 sq. mm.	428.7 mm.	400.0 mm.	376.0 mm.	350.4 mm.	333.0 mm.
10,000.00 "	457.5 "	500.0 "	400.0 "	372.6 "	354.4 "
11,289.06 "	484.8 "	450.6 "	425.0 "	395.4 "	376.4 "

<sup>1</sup> Equal to each of the three standards.

the board, which had an area equal to the standards shown. (For size of these see Table VIII.) The standards were placed, one at a time, in an irregular sequence, in the centre of the display board. As soon as a selection was made the standard was removed and another put in its place. Each one was shown but once. The average of the twenty-five answers is given in Table IX. A great regularity of answers obtains for the standard I. There is more irregularity in the selections for the middle standard, the largest result being given for the triangle, which has the largest amount of contour. But no law can be deduced, since for the other figures there is no regularity of direction. Concerning the average variation nothing very striking is deducible. With all three of the squares there is the least variation, with the first two circles the next to the smallest amount, in the first and third triangle the next, and with the first two hexagons the greatest average variation.

TABLE IX.  
*Averages of all Results of Comparison of Contour and Area.*

STANDARD FIGURES.	Side of Av. Square Selected on Board.	Average Variation	Side of Av. Square Selected on Instrument.	Average Variation	Square root of Area of Circle Selected.	Average Variation
Triangle I,	93.5 mm.	3.9 mm.	99.1 mm.	5.6 mm.	96.8 mm.	5.5 mm.
II,	101.4 "	4.7 "	101.8 "	3.8 "	102.2 "	5.17 "
III,	103.9 "	4.3 "	105.4 "	5.23 "	105.8 "	4.6 "
Oblong, I,	94.9 "	3.8 "	99.3 "	6.3 "	94.9 "	4.22 "
II,	98.8 "	5.1 "	102.3 "	4.3 "	100.96 "	5.72 "
III,	101.8 "	5.96 "	105.1 "	4.5 "	104.9 "	4.72 "
Square, I,	93.1 "	1.7 "	100.3 "	6.3 "	96.4 "	4.82 "
II,	99.1 "	2.15 "	104.3 "	4.3 "	101.2 "	3.9 "
III,	105.2 "	2.15 "	109.3 "	4.05 "	106.9 "	4.07 "
Hexagon I,	92.9 "	4.7 "	99.4 "	5.4 "	97.2 "	3.98 "
II,	99.8 "	5.7 "	102.97 "	4.4 "	98.9 "	4.96 "
III,	104.7 "	3.68 "	106.6 "	4.26 "	106.7 "	4.6 "
Circle I,	93.8 "	3.57 "	99.0 "	6.1 "	95.6 "	2.84 "
II,	98.9 "	4.18 "	103.1 "	4.1 "	101.2 "	2.41 "
III,	104.5 "	3.92 "	106.7 "	3.34 "	108.4 "	2.84 "

EXP. 2, SERIES III.

*Figures in terms of circles.*

With the circles numbered in order according to size and arranged upon a display board similarly to the squares, the

same process of matching circles with the exhibited figures was gone through. The averages are given in Table IX. As in the selection of squares, no law is deducible from the constant direction of the answers with reference to contour. The average variations are a little more suggestive in their distribution. For all of the standard circles there is the smallest average error; the square comes next, the hexagon next, while the greatest variation is about equally divided between the oblong and the triangle. This has a slight indication that the greater the contour the greater the average errors. In this test the average errors are smaller than when selecting squares. However, the average of the selections is not quite so nearly accurate as in case of the squares. The difference is of no consequence. With the selection of circles there is a slight tendency to overestimation. With the squares a slight underestimation is noticeable.

### EXP. 3, SERIES III.

#### *Selection in terms of squares on machine.*

In the concluding experiment the standard figures were all placed one at a time, just under the square exposure on the machine. The subjects were asked to direct me whether to enlarge or diminish the aperture so that it should just equal the area of the figure shown. The results show little more regularity concerning the relation of area to contour than is found in the other two experiments. The square is judged the greatest and the triangle the least. The average errors are larger than in the other two tests, and less regularly distributed. Throughout there is a quite decided tendency to exaggeration, which is unexplainable. Had the method of placing the standard under the aperture any appreciable effect, it would be in the opposite direction and would tend to diminish the size of the selected square. It would be on the same principle as the real but unnoticed discrepancy between the upper and lower portions of the Arabic numeral 8 and other similar peculiarities.

In the two previous experiments the standard figure, which was like the series, had considerably the smallest errors. That is, when the series to select from was squares, the squares produced smaller errors in matching, and when the series was circles the smallest errors were on the circles. But by this method no such tendency is to be found. The squares have next to the greatest average errors.

## CONCLUSIONS.

1. The results show a negative conclusion so far as concerns contour acting as a suggestive factor in producing illusions of area.

2. The results show great accuracy in average estimation and small average variations

3. In using the circular series there is an overestimation, and with the squares an underestimation. That is, the standards appear the same throughout, the circles seem smaller than they really are, and the squares seem larger.

4. The machine method results in a selection of larger squares to equal the standards. That is, the machine square seems smaller than it really is and is enlarged to equal the standard.

5. Throughout, there is a marked exaggeration in selecting the equal of the smallest standards, a slight exaggeration for the largest, and a medium exaggeration for the middle one.

To Professor Jastrow I desire to acknowledge my indebtedness for the assignment of the problem and for many of the details of method and experimentation. I also desire to express my obligation to those who favored me with their time and patience in acting as subjects.

## A STUDY OF IMAGINATIONS.

BY GEORGE V. DEARBORN, M. D.,

Harvard University.

To "see things" in the ever-changing outlines of summer clouds or among the flames and embers of a fire, has doubtless in all ages been to imaginative men a source of entertainment and delight. Much of the charm of this pastime comes no doubt from the commonly accompanying circumstance of leisure, and from the novelty of exercising an aspect of mind all too little used and given freedom. Another element in the interest of the habit, however, comes from the endless variation in the forms which different persons fancy from any given contour or in any simple presented shape. For the purposes of studying the reproductive imaginations of men and women, the psychologist might well desire to take the clouds into his control and bid them serve him; but they are far beyond him and will not for a moment stay.

To reproduce, then, under applicable and controllable conditions these familiar studies of human fancy, the following simple means have been adopted, and they constitute the complete apparatus, simple enough, of the investigation. Chance blots of ink, made by pressing gently with the finger a drop of common writing fluid between two squares of paper, furnished all the variety of outline imaginable. (More explicit suggestions for the manufacture and usefulness of these characters may be found in the *Psychological Review* for May, 1897, page 390; to this article interested readers are referred.) The bits of gummed paper 3 c. m. square bearing the blots, scarce any one of which resembled any other, were then attached to cards convenient for the hand and arranged in twelve sets of ten blots each, the members of each set being numbered consecutively from one to ten with Arabic and the sets themselves in Roman numerals. Thus the back of every blot-card bore a number by which it could be registered and identified. Figure 1 is a photograph in miniature of the whole series, the characters being numbered from above downward and the sets from left to right. Observation of the picture will show how great is the variety of design. The uncommonly great interest of the subjects in the research was largely due to this circumstance, and to secure the constant attentive

effort of the subject is often no easy matter, although sometimes this means half the research done.

The subjects were mostly students in the Harvard psychological laboratory, although professors and their wives and one Latin-school girl were among the rest. The range of ages was between eighteen and sixty-two and the average nearly thirty-five. The subjects were employed as was convenient, no selection of any sort being made, and hence they may be



FIG. 1.

said, as far as any relation to imagination is concerned, to have been an average set from their particular social grade of culture and education. In the case of every subject some brief sketch of his or her early life was obtained as regards familiarity with various animal forms, and concerning fairy stories, mythology, and the like, and as regards possible habit of watching clouds and other natural forms as a pleasure of the imagination. It was expected that subjects raised on a farm, hunters, and artists would have a store of advantage over those of contrary habits. Among the subjects were two poets and two artists, and all of these were well toward the top in readiness and variety of response. One of these two poets made the shortest average of times, and the subject who had the longest average is a young man little fond of verse.

The experiments were conducted with the subjects always in normal condition as far as could be learned, and at an average hour of the day as regards fatigue and meals. Each was particularly instructed "to look at the blot-card always



right-side up, turning neither the card nor the head; to try to employ the whole character if possible, not allowing it to separate into parts while being observed; not to be too particular to get a perfectly fitting object in mind, but to tap at the moment of the consciousness of the first suggested image; to react by a sharp tap as promptly as possible; to report each concrete object suggested as concisely as possible, with any suggested general action of the same, and, especially, only such details as occurred before reaction by the tap." The method of the experiments was, then, simply thus: A set of blot-cards being arranged in order face down and a stopwatch in hand, after a warning, Ready! one second previous, a blot was quickly placed before the subject at his or her proper visual distance. Upon the discovery of the blot's likeness to any object, the subject tapped and, the time being registered, a brief description of the suggested object was recorded opposite the number of the character; and so on through the entire series of 120, or, more commonly, until decrease of interest or evident slowing of reaction indicated the beginning of fatigue (which was carefully inquired after and noted), when the experiment was promptly suspended for the time. None of the subjects had seen the blots before the time of the experiment.

As would be supposed after observing the different characters as represented in the illustration, most of the replies to the general question, What is it? were various in the extreme. This variation is least in set number one, as the blots of that file were selected and placed together as the first set, that their relative easiness might compensate for the novelty of the experience and slowness of reaction in unprofessional subjects.

The figures in the accompanying table indicate in seconds averages of the times for the ten blots composing each set. In these results the interesting cases of apparent inhibition are included, it being practically impossible to discriminate such cases of exception from slow examples of associative imagination, and no cases of inhibition being long or frequent enough to essentially vitiate the average of any subject. These periods of inhibition have an interest in themselves, for although much like ordinary cases of amnesic aphasia, they differ from them in that here the blocking seems to be among the brain paths or currents representing objects instead of among those representing words, as is the common case. Perhaps for a minute or two the subject would sit staring at the blot, but wholly unable to see any resemblance in it to any object, and this wholly independent of any inherent oddity of the character, and of inattention. The real

SUB- JECT.	Approx. Age.	AVERAGE TIMES, IN SECONDS.												AV.
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
A.	23	5.4	4.6	4.3	9.0	4.3	7.6	6.8	8.2	6.8	14.8	8.5	7.8	7.3
B.	28	5.3	13.4	16.1	4.7	13.7	16.2	6.3	23.6	5.3	31.2	8.0	11.3	12.8
C.	21	6.3	15.0	14.2	8.4	14.1	27.5	15.5	12.5	12.4	8.4	8.1	8.6	12.6
D.	24	3.2	12.5	25.1	10.7	13.1	27.8	30.0	23.0	15.4	4.0	3.5	7.9	14.7
E.	22	5.3	4.0	9.6	9.5	10.2	12.4	19.5	9.6	7.3	12.0	11.8	8.9	10.0
F.	30	18.7	13.1	8.8	4.6	8.0	9.5	8.6	7.1	4.5	8.3	10.2	6.1	8.9
G.	27	6.3	23.3	9.8	6.2	18.6	9.4	10.2	31.7	11.5	19.4	11.9	17.6	14.6
H.	60	16.4	9.0	22.4	11.5	16.4	6.2	7.3	10.6	14.9	16.6	32.6	21.6	15.5
I.	30	25.3	30.3	25.3	17.6	5.4	11.8	21.3	14.0	37.1	18.8	19.6	14.0	20.0
J.	18	12.1	10.4	13.7	13.3	9.7	21.9	27.4	16.2	14.1	15.1	14.1	11.7	15.0
K.	29	2.3	6.7	6.1	4.0	6.3	8.9	8.8	10.7	7.5	13.8	14.6	14.7	8.7
L.	29	3.8	1.3	4.8	2.9	2.2	3.8	4.9	2.2	3.3	5.0	1.8	3.4	3.3
M.	62	1.9	3.2	8.2	2.5	2.4	2.5	2.4	1.8	2.1	1.9	1.4	1.6	2.7
N.	61	2.5	6.6	15.7	5.2	4.7	9.2	2.0	4.9	6.4	10.4	5.9	4.6	6.5
O.	39	6.5	4.7	2.1	3.0	5.9	3.3	5.3	5.9	6.7	7.0	3.3	8.2	5.2
P.	34	5.7	7.5	11.6	3.5	3.3	7.0	14.6	7.5	6.5	7.1	4.1	6.2	7.5

Grand Average, 10.3

nature of these inhibitions is a problem for further research to answer. If arising from confusion or indecision between two or more resembling objects, such confusion or indecision was in these cases wholly a sub-conscious process, appearing to the subject almost always merely as a cessation of "mental activity."

The often considerable number of vacant seconds which elapsed between the application of the stimulus and the reaction image, offers a striking illustration of the entire sub-consciousness of the processes of reproductive imagination, but including in these cases much more. Here was presented a blot of ink, perceived by the subject; the next thing in his consciousness was a name of some object resembling in some respect or many the stimulus, so that a complicated process necessarily intervened. Many ancient pigeon-holes of the brain must have been searched, and a comparison made with the contents of each, followed by a judgment of greater agreement in some one case, a choice thereof, and the calling-up and utterance of a name, which again became consciousness. And this often in a fraction of a second. Such, we may conjecture, is the general process, although the many attempts at introspection gave wholly negative results. Frequent inquiry was made as to how, in what form, the suggested object came into consciousness, and the most frequent reply was that a name, articulate, visual, or auditory, was the first of

the object experienced. Sometimes, then, it was once or twice said, the connotations of the object developed. In some cases aphasia occurred and a hazy likeness of the object coming hovered for a few seconds or less before the mind. Here is a problem for research.

Instruments of precision for measuring small periods of time were not needed in these experiments, but intervals of not over half a second appeared in several instances, such reactions being as fast as regular time-reactions with judgment or choice, and much more characteristic of the reacting subject than of the blots on which the reaction occurred. The longest time required, three minutes very nearly, was by the subject with next to the longest general time average also; the two next longest were by two students of decidedly "intellectual type." Neither age nor sex shows a distinct influence in these quantitative results; habits of living, on the other hand, are clearly recorded in the figures as confirmed by knowledge of the various subjects' mental modes and occupations. The intellectual type appears in the numbers with like corroborative evidence. From the grand average of all the subjects' times, about ten seconds, it is apparent that the reactions were slower than one might *a priori* estimate from a study of the blots. Facility developed noticeably in some cases. It is curious to observe that an equal number of subjects were above and below the quantitative average; also that the slowest and fastest were nearly an equal number of seconds from the mean time, which thus doubly appears to be a true average time of these 1920 reactions. As a comparative mental test, this mode of experiment would seem to be valuable, representing accurately the mental functions upon which wit and mental liveliness depend.

The qualitative portion of this research has more of interest than the quantitative, howbeit its results are not statable in exact terms nor expressible in figures. The qualitative side better, however, suggests the mysteries of association and of the imagination, deep in the nervous substance, which future psychologists may explain. Each subject, it will be remembered, was instructed to report the *first* object which the blot suggested to him in each of the 120 cases. A comparison of these object-images gives, therefore, curious and interesting results, and leads into mazes of scientific conjecture.

In the case of no blot did over 40 per centum of the subjects agree on any one suggested object. In several instances no two of the subjects were reminded of the same thing. These two extreme blots are reproduced in Figure 2, the right blot, numbered X.10, having given the 40 per centum of agreements, and the other, XII.7, being one of those upon

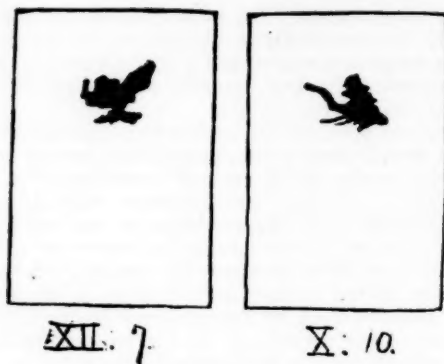


FIG. 2.

whose name no two agreed. Critical study of their outlines gives only one key to this great difference in difficulty, namely, that the one upon which there was agreement strongly suggests the familiar figure of a man (with upturned coat collar).

From out the 120 blots three have been chosen here as examples for a full report of the subjects' answers, the times being also given for greater completeness. These three characters are reproduced in Figure 3, and their respective descriptions follow :



FIG. 3.

## III.1.

SUBJECT.	IMAGINED OBJECT.	Times. Seconds.
A.	Cabbage head.	3.
B.	Animal with mouth open.	46.
C.	Fairy on a cloud.	11.
D.	Woman, seated, basket of vegetables in her lap.	12.
E.	Top of an Indian's head, nose swollen.	4.
F.	Grotesque Indian's head.	22.
G.	Rabbit sitting hunched up.	16.
H.	Potted plant on the ground.	7.5
I.	Rooster sitting in a bunch of vegetables.	44.
J.	Grinning head of a beast.	3.
K.	Head of chicken with a top-knot.	2.
L.	Monstrous man's head.	1.5
M.	Flower.	2.5
N.	Cock's head, comb erect.	4.
O.	"Punch."	1.5
P.	Head of a woodcock.	6.

## VIII.4.

SUBJECT.	IMAGINED OBJECT.	Times. Seconds.
A.	Puritan scold about to be ducked.	9.
B.	Woman extending her hand.	2.
C.	Veiled woman on a stool; basket at her feet.	8.
D.	Woman on stilts.	16.7
E.	Mermaid enveloped in her hair.	6.
F.	Fore part of a grazing deer.	3.3
G.	Bear.	4.
H.	Man sitting on the limb of a tree.	3.8
I.	Monkey on a three-legged stool.	4.5
J.	Dog, tail very straight.	7.
K.	Man digging.	3.
L.	Girl in a high-chair throwing something into a basket.	1.
M.	Chimpanzee.	4.
N.	Old woman sitting on a tub on two legs; children at right.	1.3
O.	Person sitting on a person in a chair.	4.
P.	Woman sitting on a rock.	4.5

## IX.10.

SUBJECT.	IMAGINED OBJECT.	Times. Seconds.
A.	Demon on a beast.	4.
B.	Monster's head.	16.3
C.	Head of an Arab.	8.
D.	Running animal frisking.	2.
E.	Girl in a tall cap, seated.	4.
F.	Running pea-fowl, head on one side.	6.2
G.	Chimera.	11.5
H.	New style lady's bonnet.	70.
I.	Head of some one-eyed creature.	33.5
J.	Bat, flying.	47.8
K.	Two shrimps.	20.
L.	Child falling from a tub, falling from overturning stool.	2.
M.	Half of a sweet-pea bloom.	3.5
N.	Snake coiled around a stick.	3.
O.	Horseshoe-crab.	5.
P.	Human head (left part of blot only).	21.

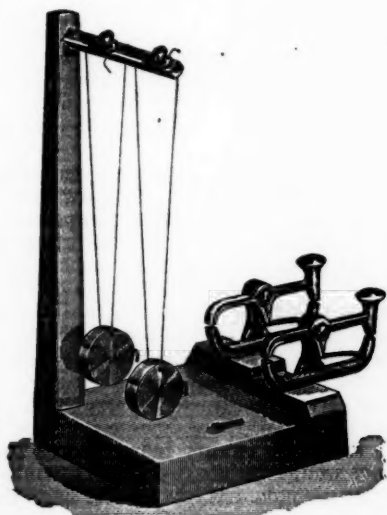
Why one subject should see in a blot a "cabbage head" and the next an "animal with his mouth open," or why a professor should be reminded by a blot of "half a sweet pea blossom" and his wife of a "snake coiled round a stick," of course no one can at present pretend to explain. There is a temptation in such cases of association as these to call the results the choice of chance, but this means too little—or too much. It is clear that, as a general principle, the experience, and especially the early experience, of the subject has important influence. For example, study of the records shows that subject H., a purely domestic woman, is reminded most often of domestic objects; while subject O., who is an artist and student of mythology, sees in the blots many picturesque and fanciful things. The difference between the imaginations of the country and city bred is clear. Altogether there is evidence here that the laws of the reproductive imagination, still for the most part hid in the neural paths, are substantial laws, which may one day be found entirely out and reduced to words and to more or less of mathematical certainty of statement. Meanwhile it is something to establish, if possible, in a manner unmistakably demonstrable, the empirical conditions under which this "faculty" of mind performs its marvelous combinations and effects, for the imagination is one of the most interesting as well as most important phases of mentality.

In particular would it be interesting to know to what degree, if at all, the fixed ideas, delusions, and changed emotional conditions of what the Germans term conveniently *der Wahn*, influence and subvert the reproductive imaginations of the persons who are the victims of these obsessions and delusions, fixed into their mental natures deep as life. Perhaps an attempt to answer these interesting inquiries may form the substance of another research conducted with this same set of blots.

## THE VERNIER CHRONOSCOPE.

By E. C. SANFORD.

Some years ago, the writer described a simple chronoscope on the principle of the vernier, capable of measuring short intervals of time in hundredths of a second.\* The instrument was crude, and probably has never been put to serious use, but the need of a number of time instruments of some sort for a brief practice course at the Clark Summer School of 1897 led to a second attempt and finally to the instrument pictured and described below, which has proved itself very satisfactory in actual use and won commendation from several who have seen it.



The essential part of the instrument is the pair of unequal pendulums at the left. The longer of these is of such a

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\* This JOURNAL, III, 1890-91, 174. The idea was borrowed from the astronomer Kaiser, who used it more than forty years ago in studying "personal equation."



length as to make one complete swing (i. e., to traverse its arc and return to the same point) in 0.80 seconds; the shorter makes a complete swing in 0.78 seconds, thus gaining 0.02 seconds at each of its swings, and fixing the unit of measurement of the instrument at one-fiftieth of a second. With these rates, if both pendulums start together, the shorter will gain a whole swing of the longer, and they will be together again after forty of its swings;  $0.80 \div 0.02 = 40$ . If the shorter starts later than the longer, it will gain as before at the rate of one-fiftieth of a second per swing; and in order to know in fiftieths of a second the interval by which it started later, it will only be necessary to count its swings until it catches up; and in general to measure any short interval, it will only be necessary to start the longer pendulum at the beginning and the shorter at the end, and to count the swings of the shorter up to and including a coincidence. The number counted is the interval expressed in the units of gain, that is, in fiftieths of a second.

The counting of the shorter corresponds to the common usage in counting a vernier, but in this instrument the counting of the longer pendulum is from its position somewhat easier, and as the number of swings is the same in either case, no error is introduced by so doing. In the remainder of the description it is assumed that the count is made upon the longer.

In measuring intervals of over 0.80 seconds, the long pendulum will complete one or more swings before the short pendulum starts. When this happens a difference must be made in the counting. For each whole swing made by the long pendulum, *before the short one starts*, forty units must be added to the value given by the count while both are in motion. Suppose, for example, that the long pendulum has made one swing before the short one starts, and that six more swings are made before the coincidence, the total time would be  $40 + 6$  units of the instrument, or 0.92 seconds, in the perfectly adjusted instrument. If the long pendulum should make three whole swings before the shorter starts and then twenty more swings to the coincidence, the time would be  $3 \times 40 + 20 = 140$  units of the instrument, or 2.8 seconds. With a little care the measurements of these longer times need offer no difficulty.

How the adjustments of the pendulums are made will be explained after the construction of the instrument has been described.

#### *The Construction of the Chronoscope.*

The base of the instrument is of cast iron ( $4\frac{3}{8}$  inches long,



4 inches wide and  $\frac{3}{4}$  of an inch thick). On one corner of it rises a column ( $7\frac{1}{2}$  inches high, above the base) which, with the little platforms supporting the keys, is cast in one piece with the base.

From the top of the column an arm extends forward over the base  $3\frac{1}{2}$  inches. This is made of quarter-inch square brass rod and is set cornering so as to allow the threads of the pendulums to hang from an edge. One end of each thread is tied fast through a hole in the arm, and the other is clamped under the head of the corresponding screw on the upper side of the arm, thus providing an easy adjustment in length. Both the tied and the clamped ends pass up over the upper edge of the arm and down on the right side, where they lie in four narrow file cuts to prevent them from slipping laterally and thus altering the length of the pendulums. This is a slight feature in the construction, but important for accuracy. The threads are ordinary silk butt n-hole twist, red for the long pendulum and blue for the short. The bobs are brass disks a little over an inch in diameter and three-eighths of an inch thick. The length of the longer pendulum is approximately  $6\frac{1}{2}$  inches, from the edge of the arm to the center of the bob; that of the shorter, approximately  $5\frac{3}{4}$  inches.

The pendulums are released from the keys at the right in the cut. Each of these catches between its lips, represented as half open, a little loop of wire like that lying upon the base, and into the loop is dropped the hook on the side of the bob. When the knobs of the keys are depressed, the loops are released and the pendulums start. The structure of the keys is very simple. The upper bar turns on the screw as a pivot, and is held in either the closed or open position by the spring, which acts upon the downward projecting cam.\* A round brass post extends downward from the under side of the lower bar, fitting into a hole of the same size in the base, and is held in place by a set-screw not shown in the cut. This arrangement provides a vertical adjustment of the keys, by which they are easily brought into the right relation to the pendulum.

The instrument in this form can be used for reactions with auditory or tactual stimuli; for use with visual stimuli, a small addition is required which is described below, in connection with the method of using the instrument for reactions to visual stimuli.

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\*This plan was suggested by Prof. Jastrow's reaction key, this JOURNAL, Vol. IV, 1891-92, p. 210.

*Adjustment and Control of the Instrument.*

The adjustment and control are as simple as the construction. The long pendulum must first be brought, by varying its length, to swing in 0.80 seconds, that is, 150 swings in two minutes. If the timing is done with a stop watch, this is easy for a single observer; if with an ordinary watch, it is a little more convenient to have the time kept by one observer and the count by another. The pendulum is started; observer A taps upon the table for the beginning of the two minutes; observer B begins the count, calling the first count "naught," and continues till A taps for the end of the two minutes. The pendulum is then lengthened or shortened, as the count indicates. It would be a long process to get the adjustment so exact as to give just 150 swings, but that is not necessary. It is better to accept an approximate adjustment (e. g., 149 or 151), and to apply an arithmetical correction later if necessary. The short pendulum is better regulated by the long one than directly by the watch. Both pendulums are set swinging, and the count started at a coincidence (called "naught") and the counting continued till the pendulums are exactly together again, which should happen at the end of the thirty-ninth swing of the longer. As before, an approximate adjustment is sufficient.

Adjustment in the last case is a somewhat more delicate matter than before, and if time is short, one which brings a coincidence at the thirty-seventh or forty-first swing will serve. It is more important to know the exact swing upon which the coincidence occurs than it is to make it occur upon a particular one. If greater accuracy than can be reached by a single count is desired, the counting may be continued through two or more periods. An adjustment giving a coincidence at  $39\frac{1}{2}$  swings, for example, would show the second coincidence at 79, the third at 118.5, and so on.

The adjustments can be made more rapidly than might be inferred from this description of them, and once made require no more than an occasional counting to make sure that they have not changed.

The arithmetical correction above mentioned is easy to obtain. Suppose, for example, that the long pendulum is found to swing 148 times in two minutes and that coincidences occur every 37 swings. This will mean that the time of a single swing of the long pendulum is 0.81 seconds, and that the short pendulum makes 38 swings to 37 of the long.

The unit of the instrument is then 0.0213 ( $0.81 \div 38 = 0.0213$ ), instead of 0.02, as it would be if exactly adjusted. In this case the final records would be reduced to hundredths of a second by multiplying by 2.13 instead of by 2. For many demonstrational purposes no correction at all is necessary, all records being kept directly in the units of the instrument.

*Methods of Using the Instrument.*

For simple reactions to auditory stimuli, the method of operation is as follows: The subject and operator being in place (the latter with closed eyes) and the pendulums hooked into the loops, the operator gives a "ready signal," and a second or two later taps his key smartly with the back of a pocket knife or other convenient bit of metal. The tap releases the long pendulum, at the same time producing the sound to which the subject reacts by pressing his key; the operator counts the swings of the long pendulum till the two are in coincidence, and the number is the reaction-time in the units of the instrument.

Sometimes the coincidence seems equally good on two swings. This indicates that the real coincidence fell between them, and the record is to be made accordingly. If it has seemed to occur on both the 10th and 11th swings, the record is 10.5 swings. For this reason it is well not to cease counting at the first sign of coincidence, but to continue till separation is evident, noticing, of course, to which swing, or swings, the coincidence really belongs. The counting and the judging of coincidences require a minimum of practice, but the knack is very soon acquired.

For reactions to visual stimuli, two small changes in the apparatus are needed. A screen must be set up between the subject and operator, and an arm attached to the operator's key for presenting the visual stimuli at the instant of the release of the pendulum. For holding the screen, a vertical saw-cut has been made in the base of the instrument, half way between the keys and extending an inch or more toward the center. A stiff piece of cardboard a foot or so square set into this cut will stand of itself and furnish all the screen necessary. (The cut is unfortunately not shown in the illustration above.) The arm for carrying the visual stimuli is a vertical brass rod, about five inches long, screwed into the operator's key just above the pivot. At its upper end, this rod carries a spring clip, into which are set the bits of black, white, or colored cardboard, about an inch square, which serve for the visual stimuli. When the knob of the key is depressed, the rod is thrown to the right and

the stimulus card brought before a suitable opening in the screen. The movement at the top of the rod is only about half an inch, but this is sufficient for most purposes. Since the pendulum is released the instant the depression of the knob begins, the opening must be rightly placed and the edge of the stimulus card must lie as near to it as possible. To facilitate this the card is also brought as close as possible to the screen by giving the rod a double bend toward the other key. The noise produced by the striking together of the right ends of the bars of the key when the key is suddenly opened is a disadvantage in visual experiments, and may be obviated by slipping over both (as if to connect them) a half-inch bit of quarter-inch rubber tubing, in the middle of which a little cotton has been placed. The noise may be very much diminished in this way without too great reduction in the movement of the upper end of the arm.

Reactions to touch, or more exactly to pressure, may be tried by having the subject place one fore-finger under that of the operator on the operator's key. He will thus receive a pressure in it at the instant that the operator's pendulum is released and can release his own pendulum with the other finger.

Reactions involving discrimination and choice, in Donder's form (*i. e.*, by reacting to only one of two or more stimuli and refraining from reaction to the rest), can easily be tried with the chronoscope arranged for visual stimuli. The number associations (adding, subtracting, multiplying, dividing, squaring, etc., etc.) can also be tried with the same arrangement, if the problem is given in such a way that the subject cannot begin to solve it till he is shown a digit through the hole in the screen. For example, the subject is told to add to 17, a number to be shown. As soon as the operator's key is depressed, he sees the digit required and begins his adding, pressing his key and announcing the result simultaneously when he has reached it.\*

With experiments in an auditory form, the range of application is still wider, any sort of association time being measurable when the operator makes the depression of his key coincide with the calling of the stimulus word, and the sub-

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\* It might seem sufficient for the subject to press his key without calling out the result, but there is probably less tendency to anticipatory reactions when vocalization is required, and the subject is in a better position to report upon his success in making the depression of the key coincide with the termination of the mental task.

ject makes the depression of his coincide with his response.\*

The following points in regard to the management of the chronoscope should be regarded. In preparing the instrument for use the operator should see that the keys are so set as to release the bobs with as little independent motion as possible, and that the bobs hang straight in the middle of their threads when at rest. The keys should catch the wire loops at such a point as to bring the threads of both pendulums approximately into the same plane. It is easier to judge the coincidences by sighting across the threads than by watching the bobs. The bobs show a tendency to wear the threads unless the holes in them are carefully smoothed, which probably could be prevented by waxing that part of the thread. It will be found convenient, though by no means necessary, to clamp the instrument to the table on which it is used to prevent the subject from displacing it by over-vigorous reacting.

The instrument can easily be given a form in which the bobs are released from electro-magnets, and one of that sort is now in the Clark laboratory. Such an arrangement, however, introduces not only the time error of the magnets—a small matter probably in any use to which such an instrument would be put—but also requires additional keys, batteries and subsidiary apparatus, which would multiply the cost beyond reason. The instrument has been spoken of as a demonstrational instrument, and such is its primary purpose, but it is evidently capable of serving for research in any case where a unit of one-fiftieth of a second is sufficiently small.

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\* For valuable suggestions, both as to construction and methods of use, the writer is indebted to Prof. E. B. Titchener, in whose "Primer of Psychology," the instrument and experiments are also described.

## AN OBJECTIVE STUDY OF SOME MORAL JUDGMENTS.

BY FRANK CHAPMAN SHARP.

In an article in the *Philosophical Review* for May, 1896, an attempt was made to explain, in part at least, the continued existence, through generations of controversy, of incompatible theories of the moral life. It was shown that thinkers had failed to reach conclusions commanding universal consent, largely because they had based their descriptions and consequent explanations mainly, if not entirely, upon the data supplied by their own consciousness. This method of procedure might have done little harm had its implied postulate, the absolute uniformity of the moral nature, been true, but facts were adduced which seemed to force us to the conclusion either that the great majority of moralists have been and are either hopelessly incompetent or careless, or both, or that there exist different types of moral judgment, which are represented with varying degrees of completeness in different persons. If we accept the latter alternative we shall cease to wonder that those who never turn their eyes to the fields that lie beyond the narrow boundaries of their own lives, should bring in reports that are apparently impossible to harmonize. If this position be sound, the great desideratum in ethics to-day is a complete knowledge of the phenomena of the moral experience, as these are to be found in the men and women—and children—about us. Works on the morals of savages or of semi-civilized peoples, works on European morals in past centuries, valuable as these may be, are not sufficient. Even where they are absolutely reliable, the information they give us is still too meagre; we may almost say that they fail entirely to show us "the great heart of the machine." The same criticism holds of the material supplied by the biographies and autobiographies of the great dead. In their best estate they give us nothing more than passing glimpses of the life within. What is needed to-day is detailed information touching every phase of the ethical experience, including the apparently insignificant and uninteresting as well as the fundamental and impressive. Even if the scien-

tific problems of analysis and explanation be relegated to the background, as is the tendency at present, and all interest be concentrated upon the determination of the *summum bonum*—that which gives conduct its ultimate value,—little progress toward a final agreement is to be hoped for between the members of opposing schools, except as both parties are forced to face the question of the nature and extent of possible divergencies from their own standards and modes of thought.

The present article is an attempt to suggest a method for investigating the material which has been thus neglected. Since it aims primarily to set forth the validity and usefulness of a method rather than to add to the already acquired stock of information (though we believe it will not be found wanting in this respect), we have selected as its subject the examination of certain assertions in Martineau's "Types of Ethical Theory." These assertions form the main part of the foundation of his system, and yet the author presents us with no other evidence of their universality than his own emphatic *ipse dixit* and the familiar but now rather worn assurance that the existence of the moral life stands or falls with them. The writings of the great apostle of liberal theology have been chosen for our purpose, mainly because they belong to that small class of contemporary works that throw the emphasis upon the scientific as opposed to the speculative problems of ethics, that seek primarily to discover the conditions under which moral judgments arise rather than to ask for their ultimate validity. Not that this last question is not of the highest importance (Martineau himself by no means neglects it), but the more pressing need *at present* is for careful study in the other direction.

The specific theses which it is proposed to consider are four in number. The first has to do with the fundamental nature of moral judgment. Motives, not actions, are declared to be its objects. [When two incompatible impulses appear in consciousness and struggle with each other for supremacy, we become directly aware of their relative excellence or of their comparative moral worth.] "This apprehension is no mediate discovery of ours, of which we can give an account; but is immediately inherent in the very experience of the principles themselves—a revelation inseparable from their appearance side by side. By simply entering the stage together and catching the inner eye, they disclose their respective worth and credentials."\* The

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\*"Types of Ethical Theory," Vol. II, pp. 41, 45.



significance of these statements will appear more clearly if we bring them face to face with a criticism upon them urged by Professor Sidgwick. The determination of what is right will not, he thinks, except in the most trifling cases, take the form of a direct comparison of the motives which primarily urge us to action. For instance, if the duel is started between resentment and compassion, or between love of ease and love of gain, "the struggle will not be fought out in the lists so marked out, since higher motives would inevitably be called in as the conflict went on, regard for justice and social well-being on the side of resentment, regard for health and ultimate efficiency for work on the side of love of ease; and it would be the intervention of these higher motives that would decide the struggle, so far as it was decided rightly. . . . So that the comparison ultimately decisive would be not between the lower motives primarily conflicting, *but between the effects of the different lines of conduct to which these lower motives respectively prompt, considered in relation to whatever we regard as the ultimate end or ends of reasonable action.*"\* If in common with the representatives of many otherwise conflicting schools we call this end the interests or the welfare of those thereby affected, the problem to be solved may be formulated as follows: When two alternatives present themselves before a man for moral evaluation, is his judgment determined by noting their relative excellence or admirableness in themselves considered, or does he ask what the effects of the two courses of action will be upon the welfare of those thereby affected?

The second assertion to be tested affirms the absolute uniformity of moral judgments when the problem to be solved has been stripped of all irrelevant considerations with regard to the working of external forces and has been reduced to a question of the relative worth of the competing motives or groups of motives.\*\* It must, of course, be granted that the person judging has some knowledge of the meaning of the terms involved, and furthermore that his inward eye has not been dimmed by habitual disregard of the dictates of conscience. These conditions being granted, all apparent variations from a uniform standard are due, we are told, to the fact that moral judgment involves a comparison of two elements, and often but one of these is explicitly put forward. If I ask: Was B the right spring of action to follow under the given circumstances?

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\*"Methods of Ethics," 4th edition, p. 372.

\*\*"Types of Ethical Theory," Vol. II, pp. 77 f.; p. 102.



one person may indeed answer yes, and the other no. But the contradiction is only apparent. For the first party was mentally comparing it with C, and the other with A. No wonder, then, that the former looked upon it as the higher alternative and the course of action it urged to as right, while the latter judged this same course of action to be wrong.\*

Furthermore, the revelation of the moral worth of the springs of action is asserted to be immediate, because direct. "The moment this condition is realized (*i. e.*, when the incompatible impulses enter consciousness), we are sensible of a contrast between them. . . . requiring a phraseology for its expression such as this: that one is *higher*, *worthier* than the other. . . . There is no analysis or research required; it is a choice of Hercules, only without the reasoning and the rhetoric; the claims are decided by a glance at their face."\*\*

From the uniformity and immediacy of the moral judgment follows directly its certainty, the sense of necessity, untroubled by a single doubt. If the matter is decided at the first glance without analysis and without reasoning, and if the decision will hold for all time and in every place, the impulses under inspection remaining identical, then evidently no place is left for hesitation or uncertainty. As well might we doubt whether the sensation of pure white on a black background involved the consciousness of two sense qualities or only one.\*\*\*

To test these statements a series of ten questions was recently given to the members of the psychology classes in the University of Wisconsin, resulting in the receipt of 152 sets of answers, fifty-seven from young women, ninety-five from young men. The students were members of the junior and senior classes and averaged about 21 years of age. As far as is known, no one of them had previously made any study of theoretical ethics, or had, at most, anything beyond a casual acquaintance with any department of the literature of the subject. They were requested to prepare their replies without consulting with any one, in order that these might represent the result of their own unassisted judgment. They were urged to state, as far as possible, the reasons for their conclusions with the utmost fullness; so generously was this request complied with that their papers averaged between 400 and 500 words in length. In order to encourage complete frankness, assurance was

\**Ibid.*, pp. 61 f. Note the examples given.

\*\**Ibid.*, pp. 44, 45.

\*\*\**Ibid.*, pp. 72; 454.

given that under no circumstances would the identity of the writer of any statement be revealed. It should be added that the students had no idea of the use to which their work would be put and no reason to suppose that it would ever be examined by anyone besides myself. The temptation to talk solely for effect was thus reduced to a minimum. The questions were presented to them in type-written form during their regular recitation hour. They were requested to hand in written answers at the next meeting of the class, three days later. Beyond the directions already referred to, they had simply to be told to indicate the time after each question which was required for its decision; to mark each answer which they did not feel perfectly certain about, "doubtful;" and finally, if unable to come to a conclusion in any case, to state this fact instead of merely passing it by without mention. Practically no explanation was added to the printed text, beyond the information that numbers II, III, and with slight additions, I, were taken directly from life; and furthermore that the circumstances described in I (c) were very nearly realized in a railroad wreck in Ohio a number of years ago.

The questions were as follows:

1. Several years ago in a railroad wreck a lady was imprisoned in the débris in such a way that escape was impossible. Her husband, who might have extricated himself with an effort, deliberately chose to remain and die with her, in order that he might give her the support and comfort of his presence in her last moments. She herself, we must suppose, was not aware of the possibility of his escape, otherwise his aim would of course have been defeated. What is to be said of the moral character of his choice in each of the following cases? (a) If he was a clerk with the expectations of the average of his class and had no family ties apart from his wife. (b) Position as in (a), but he had a mother living with him in his home, who was very much devoted to him, but not dependent upon him for support. (c) Position again as in (a). He had a distant relative, a lady who was an invalid and absolutely dependent upon him for support. (d) If he had been a clergyman doing a great deal of good. (e) If he had been a Morse, conscious that he was on the eve of the solution of the problem of the electric telegraph. (f) If he had been an artist of very exceptional talents.

2. (a) In a small western village a switchman was just about to turn the switch for an approaching express train when he saw his little son, his only child, playing upon the track. The choice had to be made between the life of the babe and the lives of the passengers. What ought he to have done? (b) In the case just cited the man was on duty. What should be the decision under the following circumstances?

A drunken switchman has left the switch open. A man who lives near the tracks notices the open switch on his way home from work and is just about to turn it to save the train, when he sees his only child upon the track just in front of the engine. The alternative is as in (a).

3. A young man taught for a year in a private school in New York with a great deal of success. At the close of the school year he was complimented highly by the principal upon the character of his work, and, although no definite engagement was made, he was led to believe that his services would undoubtedly be desired for the ensuing year. All summer he tried to bring about a definite understanding with his employer, but letters mysteriously failed to reach their destination, etc., till when the end of September had come, no contract had been agreed upon. Then at last he succeeded in getting a personal interview with the principal. The latter offered him a salary of \$600, only two-thirds the amount he had received the year before, claiming the services in question were worth no more to him. At this the young man could only believe he had been tricked. He had no friends in the city, and his parents in a distant part of the country were unable to support him. He was just graduated from college, and had had no experience in other lines of work. Almost all school positions were already filled. In each of the following circumstances what would it have been his duty to do, or is he under no moral obligation one way or the other? (a) If he had had \$500 in the bank. (b) If he had had only enough to support him for a month or two. (c) If he had had \$500, but a wife dependent upon him for support. She, however, being willing to have him do whatever he thinks right. (d) Money enough for only a month or two, and a wife as in (c).

4. A timid child is offered some money to go into a dark room in a distant part of the house and remain there five minutes. Has he done wrong if he goes? Or is no moral question involved? The child is assumed to be old enough to be able to distinguish between right and wrong.

5. The following might have happened at the Johnstown (Penn.) flood. A man found he had just time either to warn his wife or two other women (not relatives). Both these women have family ties, etc., so that looked upon purely from an objective standpoint the death of anyone will involve as great a loss to all concerned as the death of another. What is it his duty to do?

6. In 1773, at the age of 47, John Howard began what was to prove his life work, the investigation of the prisons of England, which finally resulted in a complete revolution in the English prison system. The prosecution of this work necessitated constant traveling from place to place, and in consequence he was compelled to leave his eight-year old son under the care of strangers, for the mother had died several years before. At an early age the boy became dissipated, and before he was twenty-one was morally a wreck. The father knew what his son's habits were. On the other hand he had no evidence whatever that anyone else stood ready to take up his work for the prisoners in case he abandoned it. Suppose that he was fully convinced that under his own guidance his son might be trained to lead an honorable, moral life, was it his duty to drop his work for ten or fifteen years till his son had grown up, and thus delay and perhaps postpone indefinitely the possibility of the needed reforms, or did his duty lie with the work he had begun?

7. In Shakespeare's "Tempest" Prospero, Duke of Milan, leaves the government of the city entirely in the hands of his brother in order that he may devote himself exclusively to what may be called scientific pursuits. In other words he gives up political power in order to gain knowledge and culture. Provided his brother had been just as good a ruler as himself, and was glad to assume the duties of the office, was such a choice praiseworthy or blameworthy (morally), or was it morally indifferent?

8. It is related of the English statesman, William Pitt, that he once fell in love with a young lady, but would not permit himself to seek to win her because he believed marrying her would hinder his advancement in public life. Was such a decision morally praiseworthy, or was it wrong, or was it morally indifferent? It is assumed that in making his decision he was moved mainly by ambition, and not by a design to be useful to his country. If you consider no moral question was involved in his decision, would you think the better of him for choosing one or the other of these alternatives? If so, which?

9. If you had a friend who was a Spiritualist, would you consider it your duty to attempt to undeceive him, as long as his beliefs were harming no one else, in case that by so doing you felt certain you would (a) make him permanently unhappy, or that (b) you would weaken his moral character? Would you consider it *wrong* to do so in (a) or (b)?

10. A young man with talents adapting him about equally for trade or study, who is just about to enter college, is offered a business position that promises to lead to wealth. The demands that will be made upon his time and energy are so great that he will be unable to carry on his studies in any form. The culture he will get out of the proposed career is as near zero as possible. Is he morally blameworthy if he accepts it? If not, would you think less of him if he accepted?

In the tables, which summarize results, *R* stands for the judgment, "He did right"; *W*, "He did wrong"; *D* means that the person interrogated could not come to a decision; *X*, that no moral question was involved. The person before whom the alternatives are supposed to have been, placed is therein assumed to have chosen as indicated, in each of the following cases: I: The husband remained with his wife; II: The father saved his child instead of the train; III: The young man refused the position; IV: The child refused to go into the room in order to gain the money offered him; V: The man saved his wife; VI: Howard devoted himself to the reformation of his son (this form was adopted for the sake of uniformity with II and V); VII: Prospero devoted himself to his studies; VIII: Pitt chose to gratify his ambition; IX: I conceive it to be my duty to attempt to undeceive my friend; X: The young man declined the business position.

It will be convenient to begin our investigation with a study of the alleged uniformity of moral judgments. For this purpose the replies to questions I, II, IV, V, VI, and IX supply the best material, because these offer comparatively small opportunity for differences in interpretation, and where the grounds for the decision are stated with any degree of fullness, ambiguous answers can therefore be easily eliminated. The following table gives a summary view of the results obtained:

CLASS (1).				CLASS (2).			Final Total.
	Women.	Men.	Total.	Women.	Men.	Total.	
I (a) R	8	6	14	16	17	33	47
W	7	25	32	5	12	17	49
D	1	1	2	0	1	1	3
(b) R	14	6	20	6	7	13	33
W	14	41	55	6	13	19	74
D	1	0	1	1	1	2	3
(c) R	9	4	13	0	1	1	14
W	19	44	63	13	20	33	96
D	1	1	2	0	1	1	3
(d) R	11	5	16	1	4	5	21
W	16	41	57	13	17	30	87
D	1	0	1	0	1	1	2
(e) R	11	6	17	1	4	5	22
W	16	44	60	10	16	26	86
D	2	0	2	1	2	3	5
(f) R	12	6	18	1	6	7	25
W	15	37	52	11	17	28	80
D	2	0	2	1	1	2	4
IV R	6	10	16	5	4	9	25
W	0	0	0	1	4	5	5
X	9	8	17	27	52	79	96
D	0	0	0	1	2	3	3

	Women.	Men.	Total.
II (a) R	0	3	3
W	56	85	141
D	0	1	1
(b) R	9	21	30
W	43	66	109
D	4	2	6
V R	41	68	109
W	11	20	31
D	3	3	6
VI R	33	31	64
W	14	47	61
D	2	3	5
IX (1) a R	3	10	13
W	42	69	111
D	3	1	4
(1) b R	1	1	2
W	44	78	122
D	3	2	5
(2) a Yes	29	53	82
No	7	5	12
D	1	0	1
(2) b Yes	39	60	99
No	4	3	7
D	1	0	1

In question I the intention was to assume that the man by remaining in the wreck really would have done more to comfort the last moments of his doomed wife than by

leaving her to die alone (human nature being what it is) and that this was the consideration that led him to remain. Furthermore, that the value of his life, whether to society or to individuals, would have outweighed in each case the value to his wife of his presence at her side during the short time that was to elapse before death came to claim his own. Of course we are not unaware that many moralists believe that they believe that all such comparisons of values is impossible. We are not here concerned to deny this doctrine. 129 writes: "It seems to me that the good he could do by living would in every case far exceed the good done his wife by remaining with her." The problem is: This premise, as well as the others just mentioned, being granted, what will be the decision of different persons upon the morality of the choice? All papers that failed to face *this* question were thrown out. Among them were of course those who denied that the husband, by remaining with his wife, would really have comforted her, or at least to the same extent as would have the knowledge of his safety (a proposition which for many or perhaps most women would doubtless be true). Again, in twenty papers his action was denominated suicide, and as such condemned without qualification. These were without exception rejected, though it is possible that in the minds of some of the writers, this subsumption did not stand as the sole justification of the reprobation expressed. Finally all those were regarded as not meeting the conditions imposed by the problem that held in (a) that the life of a man in a clerk's position, with no family ties, would probably be of no special value to the world. After excluding all doubtful cases, forty-eight answers to (a) remained that gave evidence, apparently beyond the possibility of a doubt, of a complete understanding of the question in the form intended; to (b) there were seventy-six such answers; to (c) seventy-eight; to (d) seventy-four; to (e) sixty-nine; to (f) seventy-two. These are designated in the table as class (1). In addition there was a large percentage of papers whose answers were too indefinite, mainly because of brevity, to make possible any opinion whether they were a reply to the real question or not. They appear in the table as class (2). If the results thus obtained are of any value whatever, it will be seen that the alleged uniformity of moral judgments is an assumption utterly at variance with the facts. Everything, of course, depends upon the nature of our replies, but we believe they will bear careful scrutiny. That the reader may judge of their character for himself, we subjoin two representatives of class (1):



15 (a)-(f). I think that he should have stayed with his wife under all of these circumstances, as a man's first duty is always to his wife if he has one. His love for his wife and his sorrow in seeing her dying ought to be too great at that time to allow him to have any thoughts for himself, his own advancement, or what he could do for others, even though it might have been better for the world's advancement—as in cases (d)-(f)—if he had left his wife.

184 (a). To me it seems that had this man saved himself it would have been more right than to have sacrificed himself in order to give his wife the comfort of his presence in her last moments. Even in the case (a), though he was but a clerk with average expectations, it seems to me it would have been a more moral action to save himself, since there lies before every man, however humble his circumstances and in whatever position he may be placed, an opportunity for doing good. There was this possibility before this man, and on this possibility I base my belief.\*

If it should still be urged that the appearance of diversity could be cleared away were we able to penetrate into the minds of the writers, and look upon the problem in all its ramifications, just as it presented itself to them in the moment of decision, we can confine the issue to (a).

Thirteen of those who approve the choice in this case, assert that it should have been adhered to throughout under all the conditions that follow (from *b* to *f*). Of these thirteen again, ten justify their position by alleging that a man's first duty is always to his wife, the majority adding expressly that his choice ought not to have been influenced at all by considerations of the good he might have done had he left his wife to die alone. On the other hand, after throwing out all papers that resort to doubtful subsumptions, irrelevant considerations, etc., we have still thirty-two replies that condemn the choice in (a)—and of course in all the following—in language so definite that there is no mistaking the meaning. Here, then, we seem to have a solid mass of material which no further criticism could destroy, and we therefore appear to be justified in holding that the divergence with regard to this alternative, at least, is absolute and irreconcilable.

Turning now to the questions that follow we obtain precisely the same results. At one time the two contradictory views may be about equally well represented; at another, we may find a small group of dissentients confronting a compact majority. But this minority, however small, is always as firmly convinced of the soundness of its conclusions as if it were the appointed spokesman of the universal conscience, and under no circumstances have we the right to ignore its existence or to scorn its pretensions to moral insight. In what follows we have simply to take such

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\* Numbers 1-57 are written by women; numbers 101-195 by men.

explanations as are requisite for the interpretation of the results tabulated on page 202, and to quote typical examples of the various views expressed.

Question II was so definite that practically all of the replies to it could be counted without fear of error. Some few indeed, as will be seen by referring to the table, are not recorded. As a matter of fact the total never reaches its limit of 152. This may be due in any particular instance to one of a variety of causes, which it would be tedious to enumerate, as they can easily be imagined. In this case the total rises to 145, which is "high-water mark," as the newspapers say.

The following are representative answers:

103 (a). I think he ought to have saved the life of his child. I can give no very definite reason for it, but it seems to me it would be right.

123 (b). The man's first duty is to his child in this case, for he has [only] a secondary duty to road and passengers. [His answer in (a) was, save the train.]

179 (a). Duty should outweigh any other consideration in the man's mind. He did right in sticking to his post. It was a great sacrifice, but a noble one. (b) The question for the second man is: Shall I save one or many? The *one* is dependent upon him, but his loss will bring grief to only one home. The wrecking of the train is liable to bring life-long sorrow to perhaps many homes. He did right if he stood by the switch.

Another writing in a similar strain, adds: "However, not one in ten thousand would do it."

Question V again seems to offer little or no room for misinterpretation. As formulated it may indeed be "abstract"; yet, let it be given all the concrete setting imaginable, the principle at issue would still be the same. Certainly there is no mistaking the position of those we quote:

164. If he knew hundreds of people were to be swept away and drowned, without time enough to warn both of the parties, I should say it was his duty to save his wife.

129. I believe it would have been his duty to save his wife. A man is supposed to be the protector of his family first, and should rescue them unless he felt he could do *very much* more good in some other way. I do not consider that the rescue of the two other women would have done enough more good to sanction it.

158. All other things being equal, the number of lives he was able to save [determines what] is the proper impulse [to follow], and not his personal relation to the persons in danger. But I should not condemn a man for saving his wife in preference to two other women, and I doubt if any one else would condemn him. The numbers in this case are too nearly equal, though of course the fundamental principle is the same.

45. It was his duty to warn the two women, even if he had to lose his wife. Two whole families should not be made desolate to save his wife. It was plainly his duty.



Question VI assumes that the amount of good which Howard could have accomplished by continuing his work of prison reform was greater than it would have been had he devoted himself to the training of his son; how much greater, Howard himself could of course not know. It goes without saying that different persons will estimate the effects and the probabilities to be considered differently, nevertheless the contradictions to be found here are genuine, as the quotations that follow will show:

184. If John Howard felt confident that he could train his son into a moral life, I believe it was his duty to drop his work of reforming the prisoners, even if thereby it would be indefinitely postponed. I think a man's first duty to be the training of his own children.

112. To my mind Mr. Howard's duty was to carry out his prison reform work. He thereby saved many persons from becoming moral wrecks, whereas if he had given up his work he would have saved only one. The family tie is not sufficient to cause the sacrifice of many for one on that account.

With these unambiguous utterances in mind it will be found profitable to examine Martineau's attempt to account for the contradictory judgments that Howard's career has always called forth. (See "Types of Ethical Theory," Vol. II, p. 62).

If the answers to IX are to be conclusive, one condition must be taken for granted which is not expressly mentioned in the text, namely, that, as one student puts it, "the Spiritualist belongs to the harmless type" and is therefore not likely to injure anyone else by what are here assumed to be his superstitious beliefs. An explicit statement of this condition was not demanded. It will be either stated (as it is by many) or assumed by all those who do not consider it a duty to deprive him of his faith. The only ambiguity will be in the answers of those who contend that all error must be killed regardless of consequences. In this class there is but a single paper that certainly meets all the conditions required, though at least two others offer every appearance of being conceived in the same spirit. But the outcome would have been the same had this position been entirely unrepresented on our list, for it has elsewhere found a champion who, in definiteness of statement, leaves nothing to be desired, while his rare attainments and disciplined judgment insure us equally against hasty and ill-considered expressions of opinion and against utterances that are the outcome of mere narrow-minded bigotry or provincialism. We refer to the brilliant author of the "History of Rationalism in Europe." His view may profitably be compared with that of the majority of our students.

122 (a). It would be my duty to warn him in case (a), as happiness is a minor thing compared with the possession of truth. There is a happiness in drifting and sometimes an unhappiness in struggling against the current, but drifting is wrong. (b) If I thought it would permanently injure his character, I should not speak to him, but I should not think it was wrong [to do so] if there was merely danger of unsettling it with a future chance of helping.\*

49 (a) and (b). I should consider it wrong to do so in either case. Nothing would be gained, and harm would be done.

52 (a) and (b). If undeceiving my Spiritualistic friend is going to make him unhappy and morally weak, I should consider it wrong to do so. What is the use of any belief unless it brings happiness and moral strength? What have you got if you permanently take these away?

131 (a). While I do not consider happiness the ultimate end of man, yet I believe that to wantonly make a person unhappy is unjustifiable unless more vital issues than this case supposes are involved.

*Mr. Lecky:* Superstitions appeal to our hopes as well as our fears. They often meet and gratify the inmost longings of the heart. They supply conceptions on which the imagination most fondly dwells. They sometimes even impart a new sanction to moral truths. . . . The possibility of often adding to the happiness of men by diffusing abroad, or at least sustaining pleasing falsehoods, and the suffering that must commonly result from their dissolution, can hardly reasonably be denied. There is one, and but one, adequate reason that can always justify men in critically reviewing what they have been taught. It is the conviction that opinions should not be regarded as mere mental luxuries, that truth should be deemed an end distinct from and superior to utility, and that it is a moral duty to pursue it, whether it leads to pleasure or whether it leads to pain.\*\*

Question IV was selected with a view to discovering the attitude of common sense toward the dictum of Martineau that fear is higher than love of money. In attempting to make such a test we must not for a moment be supposed to

\*There is no advocate of the programme, Truth at any cost, whose statements are definite enough to be worth printing.

\*\*"History of European Morals," Vol. I, pp. 52-54. Lecky's attitude toward his own opinion is somewhat difficult to determine. From page 50 it appears that this judgment is conceived to be a plain deliverance of the universal moral consciousness. "The considerations I have adduced will, I think, be sufficient to show that the utilitarian principle, if pushed to its full logical consequences, would be by no means as accordant with ordinary moral notions as is sometimes alleged; that it would, on the contrary, lead to conclusions utterly and outrageously repugnant to the moral feelings it is intended to explain. I will . . . [advert] to two great fields in which, as I believe, it would prove especially revolutionary. . . . [One] sphere is that of speculative truth," etc. And yet on page 54, note 2, he writes: "The opposite view" (to that of his own) "in England is continually expressed in the saying, 'You should never pull down an opinion until you have something to put in its place.'" Perhaps his object here is merely to point out the incompatibility of this maxim with what he supposes to be the ethical axiom of the supreme obligation of devotion to truth.

assent to the proposition that either love of money or fear, abstractly considered, can have any definite position in the moral scale. Nevertheless it seemed at once possible and profitable to collect and compare judgments upon the relative position of fear in a concrete case with the desire on the part of a child for a definite sum of money whose employment could easily be imagined. As in I, the answers must be divided in two classes, (1): those that revealed unmistakably a recognition of the fact that the conflict lay between the fear of the dark and the desire for the money; and (2) those which, while apparently based on this conception of the problem, did not contain an explicit statement to that effect. All papers were excluded that based their condemnation of the child for taking the money, upon the possible injury that might result from the shock to his nervous system. Of those who asserted that no moral question was involved, some added that they should admire the child more if he refused the money; this declaration was, however, as always, offset by a contrary one, a certain number preferring to see the desire for the money get the better of his fear. The following quotations are taken from class (1):

154. "I think that the child would do wrong to go, as the motive is a low one, and the timidity should be overcome without bribery."

104. "If the desire for the money is a stronger motive than the fear of the dark, the child had a perfect right to go."

138. "The child's action is *morally* indifferent. I should think better of him if he let his desire for the money overcome his fear."

It will be observed that the returns from questions III, VII, VIII and X have been given no place in the tabulated reports. The reason is that they do not admit of a yes and no classification, as the questions themselves do not pretend to enumerate every one of the relevant considerations that might properly enter into a decision, and what is more important, admit of being looked at from more than one point of view. The significance of this latter fact will be brought out in another place. At present we shall confine ourselves to showing the existence of contradictory opinions here just as in everything that has preceded.

Number III raises the question whether the impulse to resent a certain injury is higher than the prosaic but indispensable desire to earn a living. It is not claimed that all the conditions are named which might properly enter into the consideration of these alternatives. Nevertheless it is believed that a comparison of the following opinions will not be without value:

168. The moral obligation is but slight, for teachers are so easily found, that his refusing to teach would hurt his employer little, if any, and would practically amount to biting off his own nose to spite his face. What there is, however, is on the side of his staying away. He should, if possible, refuse to teach on account of the harmful effect on his moral stamina of feeling for a year that he had bowed the knee to trickery and imposition. In (a) he should go; (d), he should stay; (b) and (c), doubtful.

56 (a) and (b). His duty is to refuse the position and trust to fortune; his self-respect demands that much. (c) Swallow his pride and accept the place. A man with a wife to support should run no risks. (d) Same as (c).

122. In all cases but (d) he should refuse the position. He owes a great deal to himself, to his manhood and independence. Except in (d) there is a moral obligation. However, case (b) is doubtful.

Some go so far as to claim that he should refuse the position in every case, one person maintaining that in (c) and (d) his duty to do so was not in the least affected by whether his wife consented to this course or not. Let us now turn to the other side.

50 (a)-(d). I think that under all the circumstances mentioned the young man ought to have accepted the salary of \$600. Although it would be very humiliating for him to do so, rather than run the risk of remaining idle, he ought to pocket his pride and accept the principal's offer.

191 (a) and (b). Do not appear to me to be cases of morals, but of ordinary sense. (a) If by waiting he could get a better position in the future, he had better spend his capital and wait. (b) Better go to work at a low salary, although tricked, than starve — pride does not furnish a substantial repast.\*

Question VII deals with Prospero and his transfer of the government to his brother.

26. Morally praiseworthy, as self-culture, and the training of one's powers to their highest is one of our greatest and chiefest duties. These are among the highest ends in life.

161. Taking moral to mean the preferring of the higher and finer to the lower, I should say he did right; yet it strikes me that there is little moral quality in the choice.

167. Morally indifferent. No one other than Prospero is either prejudiced or benefited by his action.

43. The action was blameworthy if he was pursuing his studies simply for his own selfish pleasure. One hasn't the right to live simply to gain knowledge and culture for one's own enjoyment.

VIII is a problem which we are told the younger Pitt was called upon to face. What will be the attitude of common sense toward his choice? Was his ambition to become the first commoner of England higher in moral worth than the love that prompted to marriage, or was it lower, or finally,

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\*Additional examples will be found in the appendix.

was he at liberty to do as he pleased? The majority, represented by ninety-one papers, declare for the last. Of this number sixteen inform us that they admire him more for preferring ambition to love; forty-four would think better of him had he given up his dream of fame and power in order to marry; seven feel no preference, and twenty-four express no opinion. Eighteen others declare that one of the motives as such stands on a higher moral plane than its competitor and an obligation therefore exists to choose it. All but one assign this position to affection. The answers not enumerated here will be accounted for later. The quotations which follow will illustrate the various types:

35. I consider Pitt's decision *morally* praiseworthy, if he was thoroughly convinced the lady would hinder his life work; for ambition should stand higher in our estimation than love.

28. I believe that love should come before ambition always, and think less of Pitt, as I do of Goethe and his Faust, for choosing the latter. A man who followed his ambition rather than his love, one has an instant dislike for. I can not understand such a man. Why love should take the lead of ambition I can not explain, simply that it is so. The "should" means moral duty. [With this we may compare 2: It stunted his character to put ambition before love.]

53. It was merely a struggle between love and ambition. I consider no moral question involved. I should think the better of him for choosing the former alternative, other things being equal.

188. I can't see any moral question. I should think better of him for following ambition.

37. No moral question involved, as the young lady knew nothing of his affection, and, so far as we know, had no thought of him as a suitor. Seeing his ambition outweighed his love for the lady, he was perfectly free to lead a life of "single blessedness." In this case I think one decision as good as the other.

The young man who is offered a position in business just as he is about to enter college (*X*) finds the desire for wealth coming into competition with the attractions of culture. In the answers that follow, interest in the problems or the activities of business life for their own sake (there would be little room for such problems in a business of slight culture value), and all considerations of the value to others of his money or his training and knowledge do not enter as determining factors, and the decision turns solely upon the relative claims of the two first mentioned alternatives.

Number 121 writes:

A man should so direct his work and thoughts in life as to get out of himself the *best* possible results; should not let the financial future throw his nature's future into shadow. It would be wrong to accept the position. I have been in the exact position described.

47. Not morally blameworthy if he accepts it. But I should prefer culture to wealth. I respect an intelligent business man who is

capable of getting an education from the business world, but I should think less of the man who chose wealth with no culture.

17. (a) He is not morally blameworthy if he accepts the position. (b) I should not think less of him. In his choice he knows he can be equally happy, and probably do the world just as much good.

The results thus far reached do not tend to confirm the dogma of Kant that an erring conscience is a chimera; but, even so, we are not at the end of our evidence. Question II raised the problem whether the obligation to save the train is more binding in (a) than in (b). Of those who agree that the duty to the passengers was here supreme, sixteen express themselves with regard to this point, and, curiously enough, just half reply in the affirmative and half in the negative. To get the exact proportion, however, we should have to include among the former all those who admit the existence of doubt in the second case (indicated, as already explained, by the word "doubtful" after the answer) without giving any evidence of hesitation in the first. When these are counted, the total for the affirmative rises to fifteen.

There are several other examples of divergence of opinion that tempt us to describe them, but we shall allow ourselves space for only one more. Granted that a man's first duty is to his wife, when the choice has to be made between her safety and that of two other women, is such a duty an absolute one? Can an increase in the number of those who would thereby be sacrificed finally incline the balance the other way? Examples of both of these possible views have been given on page 208 (Nos. 164 and 129), from which it appears that again there is no unanimity of opinion. Once more we find the two parties almost evenly matched, there being ten who answer in the affirmative and eleven in the negative. The majority do not raise this question at all.

If our study has convinced us that the moral judgments of different persons are far removed from anything resembling uniformity, we may go on to inquire whether the decisions of the individual conscience will show any evidence of continued guidance by the same general principles. In other words, may we look for consistency in the "intuitions" of common sense? A study of the replies to II (b), V and VI, will throw some light on this subject. At bottom there are but two consistent attitudes to take with reference to these three questions; one must decide throughout in favor of either the closer relationship or the more widely diffused good. In II (b) and V, it is life against life; in VI (essentially), character against character. The only material difference between II and V lies in the number of



persons concerned. While this may be sufficient to clear some replies of the charge of inconsistency, it does not help those who assert that the duty of the husband would have been the same, however great the numerical discrepancy. The justification for a decision in favor of the son in VI and against the child in II (*b*) may lie either in the supposition that Howard's reform meant nothing more than clean beds once a week and apple sauce on Sunday, instead of the transformation of the English prison system from a school of vice to something approaching a direct moralizing agency. Or it may be urged that in II there was no possibility of the escape of the passengers, while in the case of Howard there was, at least, a chance that some one else would take up his work. Finally the opposite view, that the child should be saved in II (*b*), and the work of reform continued in VI may find its ground in the fact that in the former case it is at most hundreds competing with one, while in the latter we have the interests of uncounted thousands thrown into the scale. Now it has been found possible to compile a list containing all the combinations of answers that are mathematically possible in which not one inconsistency can be explained away in the above manner. The possible combinations are as follows:

	No. of representatives.	II ( <i>b</i> ).	V.	VI.
A.		r	r	r.
B.	2	r	r	w.
C.	2	r	w	w.
D.	1	r	w	r.
E.		w	w	w.
F.	2	w	w	r.
G.	4	w	r	r.
H.	4	w	r	w.

These have been obtained from 108 papers, which include the *A* and *E* answers.\* Some of these combinations will appear, presumably, almost incredible, so we present a specimen of class *B*. 143: II (*b*). "I think he ought not to have turned the switch, because he was not to blame for the switch being open. (Doubtful.) V. It was his duty to save his own wife. VI. His duty lay in the work he had begun rather than in trying to reform his son, because if he did not, hundreds of lives would be ruined, and only one in the other case."

In order to assure ourselves of the existence of a contra-

\* The distribution of answers here was as follows: *A*, 18; *B*, 6; *C*, 2; *D*, 1; *E*, 18; *F*, 5; *G*, 33; *H*, 25. The table gives the number of those that met the tests described in the text.

diction it was necessary, in this one case, to go beyond the text of the questionnaire. Some time after the papers had been handed in, the student who wrote the above was accordingly asked the following question: If this same alternative of the reformation of a number of prisoners and the reform of a dissipated son whose rescue imperatively demanded a removal to another town, had been presented to a prison official, whose opportunities for good were very insignificant compared with Howard's, one who, if he had remained in his present position, might have reasonably expected during the ensuing ten years to restore to a life of honorable citizenship perhaps twenty or thirty of these unfortunates, whereas the chances of the appointment of a successor who would take any interest in carrying on his work, were very slight,—in such a case should the decision be as in VI? The answer was, yes. "Would you have made this same reply, if the question had been given out originally in this form?" "Yes." "Is the principle underlying this judgment consistent with that of II (*b*)?" At once the admission was made that it was not. The inconsistency had quite escaped his attention, but could be explained by the fact that the thought of the helpless little child sitting upon the track, all unconscious of his fate, before the oncoming engine, had appealed very strongly to his sympathies. Paper 123 differed from 143 only by the absence of the "doubtful" after II. The supplementary question elicited the same reply. The explanation here is probably to be found in the fact that the person in question is preparing himself for "charity organization" work, and in a problem involving the obligation of philanthropy, the claims of the many appeal to his sympathies. With these two unambiguous statements in our possession, it did not seem necessary to continue the investigation to include the remaining four members of the group. No. 181, one of the two representatives of class *C*, on being interrogated, admitted the existence of inconsistency, with the same frankness as did 143. He professed himself quite unable to explain it, however, and could only say, "Each answer represents the way I felt in regard to that particular question."

*D* has but a single representative. His contradictions can be explained (whether they can be justified is another matter) by his own statement of principles prefixed to the paper handed in, and first conceived and formulated (as was learned later) on this occasion: "It is the first duty of every man to see to it that he leaves a family (children) behind him, and that they be trained and educated so that



they will become honorable and useful members of society." No other claims may take precedence of this. It would appear, however, that the supreme obligation has been met when a single child has been brought to maturity. II (a) and (b). "If the man had no other sons, or if the conditions were such that the probabilities of furthering my principle were very meagre, I think he would be morally justified in saving his son and wrecking the train; otherwise not." This law, in its absolute form at least, extends only to one's offspring; between husband and wife it does not apply. Therefore unless his fundamental principle is affected, "the man should save the two women." That "Howard's duty is to quit" is the only possible position that he could take with regard to VI.

Class F. At the risk of tediousness we quote 43:

II (b). I think even in this case the man should have turned the switch first of all. He certainly owed a duty to his son, but that duty did not extend to saving his son's physical life at the expense of many other lives. The son would not have been killed through his father's neglect, but there would simply have been another duty that stood in the father's way, preventing him from saving his son. I have thought very much about this question in connection with the sixth. It seems to me that the two cases are much alike, and yet I arrive at different conclusions regarding them. It is very hard for me to make clear why I do this, and yet I feel the difference. V. I think he ought to have warned the two other women, but I don't believe any man would. Doubtful. Only doubtful in that I can not give reasons [marginal note]. VI. I have already spoken of this in connection with II (b). I think his first duty was to his son. One should not do evil that good may come, and it seems to me that he would be doing wrong to deliberately neglect his son in order that he might work even needed reforms. He was responsible for his son's existence, and so it was more his duty to see that he led a moral life than it was to work reforms for other people.

This paper is notable as one of the three (out of the total of seventy-two) that betray the slightest consciousness of the contradictions they are guilty of.

G and H do not call for special mention or extended quotation. No paper was admitted into either of these classes that was not fully as definite as 164 V (page 208) and 184 VI (page 209). Three or four did not give their opinion upon the broader problem raised by 164 until interviewed personally. The others supplied the needed information on their own initiative.

To many this entire exposition of the diversities in moral judgments will seem as much out of date as a polemic against the doctrine of the divine right of kings. It is just these whose attention we would bespeak for the method which has been used in this investigation. What we need to-day is a sense of the possibility—and the neces-

sity—of a systematic inductive study of the nature and extent of the divergencies in moral judgment among the members of the society in which we live, in order to supply us with material on which to build up a theory of the causes of such divergencies, this to pave the way or to form an element in a comprehensive theory of the conditions of moral judgment in general. The notion that such a theory already exists is an illusion. What we do find is a number of warring "types," each of which owes its existence to the fact that it formulates in a more or less superficial fashion such portions of the moralist's personal ideals as have happened to attract his particular attention. Those whose views are given out as a "synthesis" of "rigorism" and "hedonism" seem to imagine themselves raised above the narrowness and pettiness of the hitherto prevailing sectarianism. But without disparagement to their services to ethics, it must be said that the trail of the personal equation is over all they have written, and like those who have gone before them they have simply attached themselves to that which was congenial to their own temperament, leaving neglected much that must find a place in the completed whole. It is indeed true enough that the collection of data can never take the place of the work of interpretation, but what we need to insist upon now is that the second can never be completed till the range of the first be extended far, far beyond its present limits. One of the (we hope) many methods by which this may be done we are endeavoring to exhibit.

The next subject of inquiry shall be the alleged immediacy of moral judgments. The students were requested to indicate after each answer the length of time required to reach a decision. Unfortunately many neglected to do so, but a sufficient number sent in replies to supply data for some provisional generalizations. The first point to be noted is that the type described by Martineau and to which he evidently belongs, is so far represented as to establish firmly the fact of its existence. Five of the writers state at the close of their papers that they decided "at once" or "almost immediately" upon first reading the questions. Two others spent less than a minute a piece on each problem. This group of seven may from this point of view at least be looked upon as our "intuitionists." Whether they satisfy other requirements will appear later. Six of them are men, a proportion which, if it should turn out to be something more than an accident due to the meagre nature of the returns, would require a modification of some popular notions. It should be stated that, in addition to

these, ten—seven of whom are men—report an instant decision of a majority of the questions. The other extreme is equally well represented. Nine students report periods spent upon one, two or three questions ranging from one to three days. What this may mean appears from the statement of 167 I: "I thought about this question a day and a half; should estimate an hour and a half spent on all phases of it." Three persons experienced this difficulty with a single question; two, with two; three, with three, and one with four. The problems that caused the delay were, with four scattered exceptions, I (in the main I (a)), six persons; II (b), five persons; V, two persons, and VI, three persons. In most of these, lengthened meditation would hardly have been possible in real life! Two others report spending "a long time" on one question, and of VI, 25 writes: "I do not know." This question, or one of like import, has often occurred to me before, but I have never been able to answer it satisfactorily to myself." Of the eleven who finally found an answer after their attack of hesitation, six were young women. Between these two extremes are ranged the great majority, averaging about an hour in aggregate time, though what proportion of this was required in order to reach their decision, and how much of it was devoted to subsequent reflection, it is impossible to tell. Still it must be admitted that if Martineau's account of the process were of universal validity, no such reflection would be necessary, at least in most of these problems.\* Frequently the aggregate rises as high as three hours; only in a few instances does it fall below half an hour, except, of course, in the group of seven first mentioned. In general the young women seem to make up their minds more slowly than the young men, but this may possibly be because they are more conscientious in the performance of their task. No valuable correlations have been discovered, partly, no doubt, because of the meagreness of the data; partly also, it would seem, because none exist. It is highly instructive, however, to observe 182 answering V after three days' deliberation in the affirmative ("He should have saved his wife"), while another decides it in the negative, "at once"; equally so, to find still a third replying in the affirmative, "as soon as read." 39 spends one day upon VI, and concludes Howard should have devoted himself to saving his son; 33 after two days decides Howard's duty lay with the prisoners. A large number of others could be found who were able to decide it in either way at a glance.

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\* Vide supra page 201.

What is true of immediacy holds of certainty; both extremes exist and must be included in the count when the census taker goes his round. The man who knows black from white is well represented; he says "of course," "it is perfectly obvious that," "without hesitation I should answer," "his choice was *decidedly* wrong," etc. For others these same problems are not so easy. Not infrequently the writer is unable to come to any decision whatever, as will be seen by consulting the first table. About two per cent. of the answers are marked "doubtful," indicating that no assurance is felt of their correctness. Not infrequently a second answer, contradicting the first and intended to correct it, is written in with lead pencil, or placed in the margin; or the change of heart may be indicated as follows: 160. "He should have saved his wife. On first thought it seemed to me that the man should have saved the two women, as less suffering would be caused by the death of the wife than by that of the other two; but I finally came to the conclusion that the man was under certain obligations to save his wife which would outweigh the demands that the others made upon him." Five such conversions are admitted, one each for questions I (*d*) (*e*) (*f*), V and IX and two for II (*b*). Finally one student confesses having torn up his first paper in dissatisfaction, and having started again from the beginning. For the most part doubts and difficulties are confined for a single person to one or two of the ten main problems. In seven instances, however, the total rises to three or more. The record is as follows: 35 is unable to answer III (*b*) (*c*) (*d*) and is doubtful about V; 44 is doubtful about I, II and VI; 45 about VI, VII, VIII and X (2); 21, about II (*b*), III (*c*) and (*d*), IX (2) and X; 125, about I (*a*) (*d*)-(*f*), II, V, VI; and 145, about I, V, VIII and IX. 111, who is doubtful about I (*c*), II (*a*) and (*b*) and X, writes in conclusion: "I am not yet quite satisfied with some of my answers," and 125 closes his paper in a similar strain. Thus we find the same contrasts reappearing that we met with in dealing with the time relations.

An attempt to correlate, either certainty or doubt, with the nature of the opinions stated, showed plainly that there was no fixed principle of connection. It is possible that a survey of a wider field might lead to a different conclusion, but a study of the 1500 answers before us leads to no definite results. A close relation between immediacy and certainty on the one hand, between hesitation and ultimate uncertainty on the other, is far more probable. But what with the pov-

erty of the data at our disposal it can not be demonstrated. Nevertheless such facts as these are point in that direction.

We are now free to turn our attention to the controversy between Martineau and Sidgwick with regard to the object of moral judgments. Is conduct invariably judged right or wrong because of its perceived relation to the welfare of those who will be affected by it? Or is it approved or condemned directly at a glance according to the intrinsic worth or nobility of the motives by which it has been determined? Fitly to conduct this discussion we should have to inquire into the exact nature of "moral worth," as Martineau conceives it. Is it a name for that element, or those elements of character which call forth direct admiration, for that which Plato and Aristotle held aloft under the name of the beautiful, and which he of the "pasteboard" and "the battered hack" had in mind when he said: "Observe, Sancho, that there are two kinds of beauty, the beauty of the body and that of the soul?" To answer this question properly we should have to go far afield, for Martineau's statements on this subject are by no means coherent, the obscurity being due, in our opinion, mainly to a confusion on his part between two different questions: "What is the quality that gives virtue its value? and, What is the ground of that obligation to pursue it which is held to exist quite apart from its attractiveness to any individual mind? We are invariably informed that the latter is to be found in the will of God, and sometimes this seems to be looked upon as the source of its value also. But here a difficulty arises. On the one hand the idea of obligation can not be divorced from that of value, on the other, the value of conduct will never be placed by a man with a keen sense for realities in its mere conformity to the fiat of Omnipotence. Martineau has never succeeded in discovering the clue out of this labyrinth, hence contradiction in statement and confusion of thought. On the whole, balancing his explicit denial of the identity between moral worth and beauty of character\* (where the reasoning is plainly fallacious) against the almost equally explicit affirmation of a later passage,\*\* and attributing the

\*"If I follow impulse A, instead of B, my volition will be 'higher,'—in what scale? . . . Of beauty? Not so, for I have no such feeling for my pug nose, though I wish it were straight."—"Types of Ethical Theory," Vol. II, p. 46.

\*\* "It will probably appear to many of my readers that these two concessions—that we have the power of recognizing a distinction of kind in our pleasures, and that we have a perception of beauty in our actions—make the difference between Mr. Mill and intuitive moralists not very much more than verbal!" Quoted from Lecky, *ibid.*, p. 330.

statement of the preceding paragraph\* to the failure above noted to distinguish in the proper way between the grounds of value (the grounds on which God's own preferences may be supposed to rest), and the grounds of obligation,—on the whole we may affirm confidently that the actual phenomena our author has in view throughout are those to which the "inward eye" responds in much the same way as does sense and intellect to the daisy by the river's brim, or the starry heavens above us. At all events, apart from doubtful points of interpretation, both attitudes, the utilitarian and the aesthetic, may be taken towards the facts of the world of matter and of consciousness, and we may accordingly ask whether they appear as determining factors in our judgments of right and wrong.

A study of the replies to questions I, III, IV, VII, VIII and X will supply us with material which may aid us to a conclusion that shall be something more than a mere affirmation of personal preferences. It will show that Martineau and Sidgwick are both right in what they affirm, wrong in what they deny; that some value conduct primarily for what it brings, others, for what it reveals. In consequence the conditions of approbation appear to be not simple, as each supposes, but complex. One class of persons applies habitually one standard, a second another, while still a third, not the least numerous, alternate in the use of each, employing now one, now another, or both concurrently. The relations of these two types of moral judgment to each other, the question whether one can exist in entire independence of the other, the question whether there are other types besides these, and the exposition of the conditions which give rise to these diverse and seemingly contradictory attitudes—these are problems of the highest importance and interest. We shall confine ourselves, however, to the mere exposition of the facts themselves. This self-imposed limitation must excuse any apparent abstractness in our presentation of the two types of the approving judgment, whose existence we shall attempt to demonstrate; as if we attributed one "faculty" to one set of persons which we denied to another. It is always true that if a correct view of the facts themselves is to be obtained, mere descrip-

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\* "When the sense of beauty spreads from the sensible world to that of *character*, it goes only where the good has gone before it. . . . Character is not admired till it is there; and it is there, by the self-knowledge and self-assertion of ethical differences. Its rightness is not conditional on its beauty; but its beauty on its rightness." *Ibid.*, p. 329.



tion must be supplemented by explanation. But this would require a separate paper.

In the citation to replies to I, on page 207, we confined ourselves to such as looked at the problem solely as one involving a conflict of interests; the difference in the decisions rendered simply registering divergent views as to the priority of one claim which was in conflict with another. But there are persons with whom considerations of this nature, though not of necessity completely absent, retreat into the background, and the judgment is confessedly dictated by admiration for the personal qualities—that is to say, the springs of action—conceived to be displayed. As representative of such an attitude we may quote the following:

127. Such heroic conduct is indeed worthy of admiration under any circumstances. This is carrying out the marriage vow to love, cherish and protect to an extreme and certainly far beyond the point where failure to act could be justly criticised. Most mothers would be proud to know they had such a son, and that thought would be likely to comfort his mother in her old age. Leaving out the emotional side an invalid is no help to society, and if his life served merely to prolong her existence, the benefit might fairly be questioned. [(d)-(f). Some one would probably come forward to take his place.]

180 (a). It would seem to me in this case he showed a devotion to his wife which was commendable and heroic. To be sure, his purpose might have been thwarted, inasmuch as his wife's pain would be increased at the sight of her husband's sufferings. But he had no time to weigh all this, and I think that under such circumstances he showed a strong and brave character.

56 (a). He did nobly. A man would be a coward who would save himself and leave his wife to perish alone when he had no one else to think of. (b) He certainly ought not to bring grief to his mother when he could possibly spare her. This [entire] question troubles me greatly. Such a death is equivalent to suicide, and of course from a moral point of view that is wrong under any circumstances. But, right or wrong, if I were his mother, I'm sure I should rather he did not desert his wife. (c) I fear it is his duty to live in this case, but I am sure his conscience would trouble him ever after for leaving his wife. However, I may not be looking at this question rightly, but it seems much more heroic unselfishly to die with his wife rather than to live when she could not (as far as comforting her last moments is concerned, it would be more of a comfort to her to know that he was safe; and she could die as bravely alone, I hope). I find I can't answer this question at all. My intellect seems to tell me it is his duty to live; he has a duty to perform on earth which no one else can do. (d) I don't think one clergyman more or less would make any difference, and he ought to stay with his wife. (e) Better to stay with his wife; the electric telegraph would have been invented sooner or later anyway. (f) Stay with his wife. In this case he has no duty to perform, and the good he might do to the world as an artist is very vague. I am not satisfied at all with these answers. I think, if the question of suicide did not arise continually in my mind, they would satisfy me.

The last quotation is extraordinarily clear and definite because her position is taken in direct defiance to all utilitarian considerations. His presence at his wife's side would have done no good of any kind, because "it would have been more of a comfort to her to know that he was safe;" nevertheless it was heroic to remain, and for this reason he should have done so, regardless of his mother, of society at large, and perhaps even of the dependent invalid. At the same time the intensity of her feeling is shown by the evidently painful character of the running fight carried on between her direct approvals and the protests called forth by her subsumption of the action under suicide.

Of our 152 papers, nineteen answer the question in this spirit and from this point of view, at least in (*a*), and some of them throughout. Six or eight more might perhaps find a place in this list, but their statements are not full or definite enough to classify with any degree of certainty. Twenty condemn the act as suicide. For the remainder it is simply a question as to which of two parties may justly claim the man's services—of where he could do the most good, or whether the close relationship between husband and wife justifies him in choosing to support and comfort her during a few brief moments at the cost of sorrow or privation to another, or of some loss to society at large.

Of the answers to III, fourteen are certainly judgments of admiration; twenty-two are too brief or too ambiguous to be classified; the rest are utilitarian, claiming either that no moral question was involved, at least in (*a*) and (*b*), and sometimes throughout, or asserting that he should have refused the position because of the danger in permitting trickery to succeed, or putting forward some reason which consisted in a reference to the effects of his action upon the welfare of some of those concerned, or society at large. Of course, some of those who answer, "No moral question involved," may have failed to express a preference for one spring of action over the other only because they failed to notice this aspect of the case. But, if so, we may infer that they were not in the habit of settling moral problems by looking for the competing motives and noting their relative rank, as Martineau claims is habitually done. So that while our figures would probably have varied slightly if we had analyzed our problems and exhibited for our students all their bearings, yet the results in so far as they were different would undoubtedly have given a far less correct notion of every-day modes of moral judgment. Examples of the two varieties of answers have been given on page 212, and



additional ones will be found in the appendix. In what follows, all examples will be found under the discussion of variations in moral judgment, and in the four papers which are quoted entire at the close of this article.

In IV there are thirty-three answers (class 1 in the first table) that explicitly recognize the existence of a conflict between two motives, desire for the money offered, and fear of the dark. Only sixteen of these hold that he does wrong to give way to his desire for the money—that he chooses the lower motive thereby, and if we add to this number all those who are counted in class 2, we have at most twenty-five. Five others think that he ought to go, but give no reasons. A number condemn him for going because of the injury he may do himself by the nervous shock,—these do not appear in the table at all. The rest content themselves with asserting that there is no moral obligation one way or the other, the few who vouchsafe any explanation adding, "because he didn't do himself or anyone else any harm."

The answers to VII must be divided into four groups. (1) contains the ambiguous ones—"Prospero's choice was praiseworthy," or the reverse. Here are to be found twenty-four papers, all but one of which approve of his actual choice. (2) Culture is declared to be an intrinsically higher or nobler pursuit than power—judgments of the form that Martineau's theory requires. Two of the total of eight are cited on page 212, and two on 231 and 232. (3) Seventy-seven judgments are rendered from a purely utilitarian standpoint; *v.* references as above. (4) The answer is simply: "No moral question involved." Even after making all possible allowances for obtuseness of vision these judgments seem as directly incompatible with Martineau's theory as those of (3). In fact, in the great majority of cases it is undoubtedly the same position, stated without explanation of the grounds on which the decision is made.

An examination of the replies to VIII leads to similar results. Martineau's attitude is represented by nineteen papers. There is not, however, complete agreement as to which spring of action is to be assigned the higher rank, seventeen deciding in favor of affection, one for ambition, while in one the writer declares himself unable to choose. But even in this small number we find eleven introducing utilitarian considerations, as does 194, for instance (*v.* appendix), leaving but eight in which the attention is directed solely to the intrinsic worth of the motives themselves, without any thought of other considerations. Eleven others condemn the choice of ambition without assigning their reason, and five more make the same reply with the understand-

ing that Pitt's motives were purely selfish. Still another group, again numbering eleven, hold that an obligation exists in favor of one course, but do not appear to find its ground in the relative rank of the contending motives; the considerations adduced are, in the main, the obligation due to himself to marry in such a way as will best conduce to his own happiness, or the duty of considering the lady's happiness, provided that he really loves her, or the duty he is alleged to owe himself to rise in fame and power as high as his abilities will carry him. Ninety-one consider no moral question to be involved—he is free to do as he pleases. About half of them assign no reason for their conclusion; the remainder fall into several groups, according to the nature of the conditions under which alone their decision is stated to hold good; of these the principal ones are that the young lady's feelings are not to be taken into account, and that Pitt was to no appreciable degree moved in his choice by a desire to be useful to his country.

The same types recur in X. Those whose judgments are clearly based upon a comparison of the intrinsic excellence of the competing motives here number twenty-seven, of whom six fortify their conclusion by the claim that a man of education can be of more value to the world than a man of wealth. Fifteen others cannot be classified; some of them may perhaps belong to the first group. Two find it impossible to make up their minds whether any obligation exists in favor of either one of the alternatives or not. Twenty-five judgments are plainly representatives of the pure utilitarian standpoint. Finally seventy-six assert that no moral obligation exists to choose one course rather than the other. The question, "Would you think better of a man for choosing one or the other of these alternatives?" forces everyone to face the problem of the relative excellence of culture and wealth as ends of action, so that members of this group have practically placed themselves outside the pale of Martineau's theory. With regard to this last question, forty-five would think better of him for choosing the college education, twenty-one would think neither more nor less of him for so doing, and ten do not reply. For example *v.* page 213 and appendix.

Of the four remaining questions little need be said. Express or implied references to the relative rank of motives do not appear except in isolated instances. In II (*b*) the majority of 109 argue, except in two or three cases, after the manner of 179, the minority like 123 (page 208). Answers such as that of 16 (page 231), stand as solitary as Heine's fir tree. And yet if throughout attention has been directed immedi-

ately upon the quality of the motives, we cannot but wonder that the fact does not appear in the language employed. The same results appear in V, VI and IX. The decision in V and VI seems always to turn on the place where the superior obligation to service lay; of course, this may be *interpreted* as equivalent to asking whether conjugal or parental affection is higher than compassion for several or for many; on the other hand there is no evidence that the problem presented itself in this form to the minds of the writers. Again in IX the majority who, it will be remembered, subscribe to Gray's well-known creed, mention no other consideration than the happiness or the character at stake, while in the ranks of the minority appears no one who writes on his banner: The impulse to make others sharers in our own views of truth is higher than a regard for their happiness. The nearest approach to such a formula has been given on page 210.

If the evidence adduced has been sufficient to establish as a fact the application of these two criteria—the aesthetic and the utilitarian—to the solution of moral problems, it only remains to inquire whether the causes, whatever they may be, that produce either of the two corresponding attitudes are operative in the same persons under all circumstances; whether, in other words, there is a type of mind for which Martineau's description holds without exception and another which stands in a similar relation to Sidgwick's theory. Beginning with the latter, we may propose a looser and a more severe test. If we count as utilitarians those who appeal explicitly and exclusively to the effects of the action under consideration upon the happiness of the agent, or other individuals, or the welfare of society at large, in one or more of the following questions, viz.: I (a), III (a), IV, VII, VIII, X, and who, furthermore, nowhere introduce any references to the qualities of springs of action or the relative superiority of one over the other, we shall have a group with sixty-seven members. On the other hand we may adopt a criterion which seems to exclude the possibility of any mistake. We may count only those who in every one of these six questions either make a direct and unambiguous appeal to utilitarian considerations, and to these alone\*, or who, while recognizing in any given case the existence of a conflict between two impulses, assert that there is no obligation to choose either one or the other (for example, *v.* papers 53 and

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\*This is interpreted so as to exclude from the group those who in I (a) condemn the action of the clerk as suicide.

37, p. 213.) This second condition was introduced primarily to cover a single answer in one paper, 191, which beyond all doubt belongs to this group. It will be referred to again on page 231. As a result of this sifting process we have nine papers of whose attitude there can be no possible doubt; in fact, they read as if written to serve as illustrations for the "Methods of Ethics." In the appendix two of them will be found quoted in full; they were selected as representing very well what may be roughly distinguished as the philosophic and the common sense types of utilitarianism respectively. Positive assurance can be given that neither the writers of these nor of the other two papers quoted in the same place, had ever made any study or ever done any reading in the field of systematic or applied ethics or of philosophy in general, or had picked up ideas or theories from other students who had done so. Their views, and the language in which these were expressed, were purely their own, with the exception, of course, of the ever popular "greatest good to the greatest number," which, it appears, was picked up in the university debating societies, where it has long been a favorite weapon.

Turning now to the use made of the aesthetic criterion, we should expect to meet with a similar showing. Quite the reverse, however, is true. Its appearance at intervals is indubitable, but with rare exceptions, its employment is sporadic, confined, in the main—as our evidence goes to show—to one or two problems. Not only do considerations conceived in this spirit fail to appear, with an occasional exception, in II, V, VI and IX, but there is no one example of its use in all the remaining six questions. No. 194, whose paper is given in full on page 232, is alone in exhibiting the presence of this point of view in as many as five answers; but on the other hand, the union of the aesthetic and the utilitarian standpoint is particularly marked in him. Four others decide four questions on grounds of admiration for springs of action; four more decide three in the same manner; thirteen others, two, and forty-six, one; making a total of sixty-eight who show some trace of the use of the "aesthetic method of ethics." \* Of these there are but four who in every case keep themselves entirely "unspotted" from utilitarianism, as that was defined in making up the second group of nine (page 227). The exclusion of those who, while distinctly recognizing the fact of a conflict between certain

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\* We have seventeen papers left that are still unaccounted for. They gave no reasons for their replies in any instance and their position is therefore impossible to determine.

motives, refuse to adjudge one higher than the other may on first thought seem arbitrary, but we have Martineau's own statement (and it is in the main his doctrines that we are testing) that whenever two impulses come into competition, one of them is immediately recognized as the higher. Moreover, the application of this test excludes but six at the most. One of these is 16, the propriety of whose rejection (on the ground of her answer to III) may perhaps be questioned. If this is allowed to stand we have but one member of this small group of four who answers as many as three questions from the aesthetic point of view. The other three are included on account of their answer to a single question; as outside of this they vouchsafe no reasons for their conclusions whatever, their presence in this group may perhaps be merely due to their preference of golden silence over silver speech. In the appendix will be found paper 16, which, everything considered, comes nearer to representing the type of mind described by Martineau than any other in our possession. 194 is of interest as an example of the fusion of the two modes of judging. The following table exhibits the nature of the answers to our six test questions of the nine leading representatives of the aesthetic attitude. *a* indicates that the answer was based on grounds such as Martineau would lead us to expect to find; *u* is utilitarian in the sense defined on page 227; a dash indicates that the answer was rejected on account of ambiguity, or for some of the other reasons referred to in the earlier part of this article; a question mark, that the writer gives no reasons by which his attitude can be determined; *u* with a question mark, that the writer, without explicitly mentioning the two competing impulses and without stating the grounds for his opinion, affirms that no moral problem is involved. *S* in I means that suicide was assigned as the ground for condemnation.

No.	I (a)	III (a)	IV	VII	VIII	X
11	a	-	?	a	a	u (?)
16	s	u	a	a	a	a
26	a	u	u	a	a	{ a u
35	u	a	?	a	a	a
39	u	a	a	u	u	a
48	u	a	u (?)	{ a u	a	{ a u
127	a	a	-	u	u	a
141	?	a	a	u	a	u
194	u	a	a	a	{ a u	a

Should a broader induction confirm the results here obtained, we should have to admit the existence of at least

two "methods of ethics" which may even dwell in the same mind side by side. Furthermore, we should be compelled to recognize the fact that on the whole the aesthetic plays a subordinate rôle in comparison with the utilitarian, and that even in those to whom it means most it may disappear at times before the pressure of the demands of the "utilities." How impossible it is for the mind to so far abstract from the felicitific consequences of conduct as to deny them any share in the formulation of moral judgments, is well shown by the following remark of Martineau, incidentally dropped in the discussion of other matters: "By importing a distinction of finer or more vulgar into human satisfactions, you do not step into the region of morals, but only change the field of extra-moral good. . . . All that you can say to any one [who prefers the coarser to the more refined] is, 'You do not make the best of the resources of your nature:' and he may answer, 'Perhaps not; but I am the only sufferer by the waste, and am therefore a squanderer only, and not an offender; I wrong no one but myself; and am simply a poorer economist.'"\* The note here struck is entirely out of harmony with all else that he has written, but it reveals the existence of forces which, ignore them as he may in his hours of speculation, undoubtedly play an important part in his every-day judgments of right and wrong. Not that Martineau has entirely ignored the existence of a "canon of consequences;" no one could possibly do that.\*\* But he has failed to recognize the importance of the part it plays in the life of men, and he has not succeeded in assigning to it its proper place in the constitution of the human mind, nor, as a result, in defining properly its relation to those forms of judgments with which he is most familiar. Similarly, the utilitarians, while to-day commonly admitting the existence of beauty of character as a fact, have never seriously investigated the nature and the extent of its influence in determining the attitude of men towards the concrete problems of the morality of given lines of conduct.

It has been impossible to establish the existence of any definite relations between the employment of one or the other of these methods and the time required to form a decision, and the certainty with which its affirmation is accompanied. The nine papers whose answers are tabulated on previous page do not differ materially in either of these respects from the remaining ones. Some answered at once, while others spent a day on the same question. On the whole this

\* "Types of Ethical Theory," II, 109.

\*\* Cf., for example, the statement on p. 271, beginning: "I will not say that no one ever . . . with Bentham, consulted the arithmetic of pleasures and pains, and struck their balance."



was to be expected. This type of mind will often find its way blocked by a conflict between what it admires and what it judges useful, a conflict to which a mind of the type represented by 191 or 192 is an entire stranger. Moreover, so much, at least, is known of the phenomena of "intuition" as to prove that there is nothing incompatible in it with judgments based in reality upon a great mass of data.

In concluding this study we may call attention to the possibilities thrown open by the method we have exhibited of an objective investigation into the causes of moral judgments. If the various answers given to questions such as these can be correlated with various mental traits, with the power of abstraction, the power and habitual direction of the imagination, with temperament, age, sex and environment, or if when brought face to face with his own inconsistencies, the person questioned can be led to describe the nature of the difference between his various attitudes toward a series of similar problems,—if this and much more of the same kind can be done, the foundation will have been laid for a theory of the conditions of moral judgment, which shall not be at the mercy of either the ideals or the whims of individuals or passing generations. Some fragmentary data of the kind demanded have been thrown into our way in the course of this investigation, but it has seemed advisable to withhold them because they can acquire real significance only as part of a system of facts, most of which still await the discoverer.

#### APPENDIX.

##### No. 16.

I. In any of the conditions he committed suicide. A man may rush into danger when there is hope of saving anyone—lose his life in so doing—that would be bravery. In this case escape of his wife was impossible—he knew it—and by remaining there he deliberately took his own life.

II (a). He must turn the switch and save the passengers. (b) To save his child would be the natural and instinctive action, but to save the train would be a higher, more sublimé choice. Morally he would be bound to save the train.

III (a). No moral obligation one way or other.

(b). No moral obligation one way or other.

(c) If he had no chance for other employment he is morally bound to "swallow discomfort" and accept position. (d) Morally bound to accept position.

IV. If the child accepted money he yielded to a lower motive, chose a lower alternative. He should be taught to do right for right's sake, not for money.

V. He should save his wife—he had promised sacredly to protect her. To the other women he did not owe this moral obligation.

VI. The duty of John Howard was to save his son. Parental responsibility outweighs any philanthropy.

VII. If the brother had no taste for any other employment than politics, Prospero's choice was praiseworthy. If the brother was



equally fitted [to rule], Prospero's choice was again praiseworthy, as one should, when possible, cultivate all talents with which he is endowed. He owes it to himself to do so.

VIII. To sacrifice love to ambition is to follow a lower motive. Ambition is sordid and selfish. From the moral standpoint he should accept love and fling away ambition.

IX (a). It is decidedly *not* your duty to attempt to undeceive him in either case. The theology of the world is in too doubtful a state to attempt to say definitely how much of truth a man has. (b) I should think it wrong in both cases.

X. If he has any one dependent upon him he is bound to accept the position, if immediate support is required. If there are no "encumbrances," if he is entirely free, the higher choice would be in favor of cultivating the mind. Wealth is a baser motive than literary attainments.

No. 194.

I (a)-(f). He would not be justified in dying with his wife. The Bible says care for the living and not for the dead. The woman in question is not dead of course, but comes within the application. It would be extremely selfish on her part to expect him to sacrifice his enjoyment of life and to expect others to forego the good he might do them. In most of these conditions great good is conceded [as accruing] to his fellow-men from him. For him to die would be a loss of the benefits of (b) (c) (d) (e) (f) to mankind. This would seem to be wrong, opposed to the express commands of Christ. Temporary comfort to the wife set over against permanent good to the world. I cannot see why (a) should be excluded either. If the clerk does some good, his life is a benefit and should be prolonged.

II (a). The man should have decided in favor of the lives of the passengers. (b) Same decision. In these cases the man was choosing between a greater and a smaller sum total of suffering. He looked [should look] upon himself and others from an objective point of view and sacrificed [sacrifice] his child on the broad principle that it was better for one man to endure, even if it was he, than that many should suffer. [The fact that he was on] duty did not make his decision more compulsory; it is not plain how a sense of duty can claim to compete at all in such a case with such a broad principle [as that just laid down] or even strengthen it.

III. I think that he is under moral obligation to reject the \$600 proposition in every case. Evidently a wrong has been committed; his own self-respect demands that he do not tamely submit to being tricked, and besides he should not be a party to the successful issue of the low scheme. Even if his wife (in c and d) had requested him to accept the position, his duty would still be as above, for there is always some way of earning a living.

IV. The child has done wrong if he goes, though the offense is light. He did for money what he ought to have done for a higher motive, namely, desire to strengthen his courage.

V. To warn the two women. Same principle as in I and II, the greatest good to the greatest number, and least sum of suffering. Warning his wife would bring more satisfaction to himself and less to others, but this would be selfish. He is supposed to look upon all as on the plane of common humanity, not as separated by artificial ties.

VI. His duty lay with the work begun. Same principle as in I, II and V. . . . Could Moody well stay home to bring up a son?

VII. The choice was praiseworthy morally because culture is a nobler aim than power. The better a man becomes himself the

better able he is to influence others to a higher life. Prospero became more noble and could bring others up to a higher level. His self-denial was itself a growth. The city was ruled as before.

VIII. Pitt's decision was unpraiseworthy morally. It was directly contrary to the principle involved in VII. He repressed love, an ennobling feeling, for selfishness, a degenerating impulse. Such selfishness persisted in might have made a spoils politician of Pitt at this day and made him less useful to his country in advocating good measures, etc., than he would have been even holding a lower position, but with higher motives.

IX. I should not consider it my duty simply on the condition of his being a Spiritualist and with results as in (a) and (b). I think it would be wrong to say anything that would bring about the results in (a) and (b). Right living and spiritual inspirations are objective things in religion, and these would not be improved by the results in (a) or (b). One would think that a Spiritualist could secure the main benefits of religion which he could not under (a) and (b)—not as well anyway. The best sum of good should here be aimed at.

X. He seems to me to be morally blameworthy. With the opportunity for either business or a college course he should choose the latter. Culture and the development of the mind are granted higher aims than money, are declared and recognized to be higher.

#### No. 191.

I. A question whether deliberate suicide can or can not be called morally right. To my mind it cannot. In these cases a man, in order to give a few moments of comfort to a dying person, deliberately gives up a life which might accomplish untold good to many hundreds. He certainly could accomplish during a lifetime results of infinitely more value than the uncertain comfort or support given in this case.

II. Love and human nature *versus* duty. Doubtless he should have saved the train because by so doing he could save a greater number of lives than in the other case. However, the ties of blood are so strong that in nine cases out of ten the man would save the child. (b) The decision should be the same.

III (a) and (b). Do not appear to me to be questions of morals, but of ordinary sense. (a) If by waiting he could get a better position in the future, he had better spend his capital and wait. (b) Better go to work at a low salary, although tricked, than to starve—pride does not furnish a substantial repast. (c) and (d) Same as (a) and (b).

IV. I think it is a question of the desire of money overcoming the fear of the dark. If any moral question is involved it seems to me to be on the side of the parents that allowed the child to grow up in fear of the dark. Then it would become a question as to the means of obtaining a desired end, whether bribery is an allowable means of obtaining this end—I think it is.

V. Question of duty to your wife or to two persons not at all connected with you; of the death of one or two persons. I presume, looking at it from the good to the world and ignoring self, one should save two lives rather than one, but the other being his wife I should say save the wife. A man owes his first duty to his family, after that to the world.

VI. Drop his work and take care of his son. There would be others who could attend to the prison reforms. No one is so all-important that his place cannot be filled.

VII. I think it may or may not be a question of morals. If he gave up political power because it was distasteful to him and

science was pleasant, he cannot be either praised or blamed, as it was simply a question of natural tendencies and of what was pleasant to self. On the other hand if both were equally pleasant and he carefully weighed the amount of good which each would accomplish for mankind and found that in his opinion science and culture would do the most, and chose the latter, I should say his choice was praiseworthy.

VIII. Does not seem to be a case of morals, but of self-gratification, the amount of pleasure being greater in one case than in the other, the desire for fame being greater than that for love.

IX. I should consider it wrong to do so in both cases. He is sincere and content with his belief and harming no one.

X. I think that culture could be obtained in great measure after he had reached a certain stage of his career (travel, literature, environment, etc.). At any rate if he is as fully satisfied with his life of business as he would have been with the culture obtained from his college education, and, on the other hand, if the latter would enable him to be a success in his chosen career after leaving college, I should say it was a matter of choice, either career being one of fame and honor.

#### No. 192.

I. In answer to question I, I would say that the man was wrong in staying with his wife in this crisis, for this reason, that it is the duty and mission of every man to do something for the good of the world; this is the object of life. In cases (b)-(f) there can be no doubt that he did wrong in sacrificing himself.

II. I think that in (b) the switchman should have saved the passengers. Reason: By abandoning the child he saved lives more valuable to the world. In case (a) he should certainly attend to his duty, because his obligation to the passengers is greater than that to the child. I believe any father in such a case would save his child, but I think his moral obligation to his fellow-men should preponderate.

III (a) and (b). I think that it was the man's duty to accept the position because of his duty to his fellow-men. By his teaching he would benefit a portion of his fellows; by staying idle he would not. In cases (c) and (d) he was morally obliged to accept.

IV. It is the child's moral duty to himself to refuse to go into the room; by so doing he injures himself and benefits no one.

V. I think it was the duty of the man to warn the two women.

VI. Here is the duty of father to son contrasted with the duty of man to his fellow-men; it is the duty of man to do the greatest possible good, hence I think that it was Howard's duty to carry on the work of prison reform.

VII. I think that Prospero was not only justified, but that it was his duty to leave the government to his brother, because by so doing the greatest benefit to his fellow-men could be wrought.

VIII. In No. VIII I do not think that any moral question was involved. If he had led the lady to believe he was going to marry her, his action would have been wrong; but as only his own happiness was affected by his choice, he was free to do as he pleased.

IX. It would certainly be wrong in case (b) to undecieve him, and also in case (a). In case (b) you would do harm to him and no good to others unless he was converting others to his belief. The same is true of case (a). If you believed that he was harming others by his belief, you would be justified.

X. It would certainly be his duty to refuse the position offered him and to attend college; by so doing he would prepare himself to bring about the greatest good.

## DISCUSSION.

### REMARKS ON TICKLING AND LAUGHING.

BY HIRAM M. STANLEY.

The interesting article on tickling and laughing in the October AMERICAN JOURNAL OF PSYCHOLOGY suggests some further remarks on the explanation of these phenomena, in a somewhat different order, and to remark upon some points little or not at all noticed by that article.

The question of the *rationale* of tickling involves: Why does this light contact so generally and acutely excite? Why does it issue in laughter?

As to the first question, "the strange sensitiveness to minimal tactile impressions" that "has never been explained," this is in the article explained by survival and revival of "the oldest stratum of psychic life," that is, of primitive touch experience when there was "no sense of gradual approach." The revival theory is a valuable one, but it appears to me that ticklishness implies tentacular experience. By temporary self-extensions even low amoeboid organisms have slight but suggestive touch experiences that stimulate very general and violent reactions, and in higher organisms extended touch organs, as tentacle, antenna, hair, etc., become permanent and very delicately sensitive organs, where minimal contacts have very distinct and powerful reactions. Tentacular experience forms the main phase of psychic life for a considerable time in biologic history, and constitutes a psychic age which is very little understood. We come nearest to it, perhaps, when groping about in the dark in a strange place and surrounded by totally unknown objects. We are then all touch, and the slightest contact induces strong though indefinite fears and activities. This ticklishness, as agitation at minimal contact, is survival of long past ancestral tentacular experience.

But the difficulty here occurs how and why tickling should be pleasurable. It is certainly evident that the function of stimulating minimal contacts has been chiefly evolved as painful agitation, intense alarm and violent efforts at flights; and that survivals and revivals *per se* can only be the same in nature. Yet we know that tickling now causes spasms of

keenest pleasure, and hence, if it is survival, it must point to some other form than the minimal contact agitation developed in the struggle of existence. And this other form we believe to be play activity. For what is play in its simplest and earliest form but a light touching in a mimic alarming? The earliest seems to be tag; and I have seen a school of fish ("suckers") thus engaged, one fish nipping slightly and playfully the tail of another, and then swimming fast away to be chased playfully by the other. The pleasurable of tickling, then, is in its playfulness and as reviving a vast mass of ancestral play experience. As Darwin remarks ("Expression of the Emotions," p. 201), "a young child, if tickled by a strange man, would scream from fear." That is, here the revival is toward the minimal contact experience of direct utility in the struggle of existence, rather than toward play activity.

This of course merely throws the problem further back, and we have yet to inquire as to the nature and *rationale* of play activity and its pleasurable. All activities from the psychic side may be divided into two grand divisions: playful and serious; and it is extremely remarkable how far down in life this distinction runs. Even low microscopic organisms have seemed to some observers to give evidence of playfulness. But play is, psychologically speaking, quite complex; as shamming for its own sake it is evidently so enjoyed by almost the whole range of living beings without reference to life values, and thus seems the primary æsthetic element. Play is appearance as opposed to reality, or rather reality putting on appearance. To ascribe play to mere overflow of energy helps but little, for we must ask, why, under natural evolution, should superabundant energy be generated. Is not this directly opposed to the law of economy which prevails in all evolution under competition and the struggle of existence? But if energy becomes superabundant, it will flow out the usual channel in the usual way, and so an irascible creature will expend this energy in fighting, *i. e.*, serious activity, which, indeed, we often see. Mere superfluity of energy does not explain why the usual activity should be used, but in a playful manner, *e. g.*, not in fighting, but in playing at fighting. Mere superfluous energy leads the puppy to bite, not play at biting; that is, playfulness is purely a mental quality, for which mere amount of nervous energy cannot account.

For the psychic basis of the pleasurable of play we may perhaps find a clue in guile. Guile and play are both assumptions of expression, but guile is earnest method in the struggle of existence in the forms of mimicry, cunning,

strategy, etc., whereas play is foolery for its own sake. Yet the pleasure in this foolery is probably derived from the exultation in successful deceit which has marked the evolution of life. Play in the primitive form is playing a trick. Play is thus feigning. One puppy feigns anger, growling, chasing, biting; and the other, feigning fear, flees. Here is mutual duplicity, and mutually understood as such, acted out for the sheer pleasure of the activity — æsthetic action, — and thus a most marvelously complex psychosis for low orders of life. Yet to fool and act the fool seems equally pleasant in the play of young animals; the pursuer and the fugitive both enjoy their pretence. However, we may well suppose that play was at first one-sided, and that the acting the fool is comparatively late evolution. We often observe such one-sided play. I have noticed a large dog which enjoys putting little dogs into a genuine scare and flight by a sudden great bark. The reciprocity of complete play does not enter here, nor yet in the case of a cat playing with a mouse. All teasing is one-sided play. How reciprocity came to be established is a difficult point; possibly as a mode of defense.

To account for play-pleasure by reference to pleasure of deceit, certainly covers many cases, and those the very crude ones of "horse play," practical jokes, fooleries, and masqueradings of all kinds. It also may cover what the article calls "Laughter at the Naïve and Unconscious," since the naïve means being "fresh," "green," "gullible."

The relation of play to higher modes like wit and humor is apparent in that surprise and contrast underlie all three. Surprise is a method of attack which is most successful in the struggle of existence, and hence most pleasurable. So the pleasure of playing in its keenest form is that of surprise, which, when cultivated for its own sake in a purely mental way, as suggested by word and action, enters into both wit and humor. And the physiological side of surprise is shock, sudden and violent agitation. Tickling is organic surprise in that there is unexpectedness as to localization. Other senses than touch may have a sort of tickling. Thus may not the sudden popping before an infant's eyes of some object, as in playing peek-a-boo, be a tickling of eye sensation? The 'peek' startles the eye, the 'boo' the ear, and the play-pleasure expresses itself in crowing laughter. I have observed a child of nine months express its merriment at a gurgling noise by a squeal made during inspiration. Snuff-taking is a nostril tickling.

Contrast is a fundamental element in play. All play is an apprehension of and delight in the contrast between the real and unreal. In one direction this culminates in



comedy, in the opposite in tragedy. There is a continuous evolution from the puppy mimicking anger to Jefferson personating Rip Van Winkle. The whole range of play is fictional and imaginative. Every action may be acted, every feeling and thought may be fictionally expressed. But play is most prominent on those levels of life which have been fully integrated. Thus the dog does not play in the forms of activity which men have taught him, as in drawing loads, but reverts to wolfish action. The most progressive forms of human activity are rarely used as play forms. There is more sport in hunting than in writing papers on psychology. Men play with the past, and that is where the main field for art lies. Those who interpret an age to itself do it in a sober, business-like, realistic, earnest way which is hardly play. The height of severest endeavor by which a race is at present progressing is not an inviting field for its play activity. Play is the outgrown clothes in which humanity still likes to masquerade.

Whether the laugh at injury to another may be related to play is perhaps questionable. And yet we know that getting another at a disadvantage is a prime joy in competitive existence, and is continually played at. The laughter excited in us at the sight of a man chasing his hat down the street is probably related to play activity and playful exultation over disadvantage to another. (A somewhat completer discussion of play will be found in my "Evolutionary Psychology of Feeling," pp. 298, 350, 364.)

But we come to the further question why the pleasurable agitation of tickling, sensuous and mental, should issue in laughter: how does the peculiar action of diaphragm, lungs and vocal organs which we term laughter, arise? and why is this reaction confined to human beings? Thus in playing hide-and-seek with a dog, when he suddenly comes upon you he will express his delight in joyful barking, while a child in like case will break into hearty laughter. Now the rise and progress of laughter in the human being is, I think, to be connected with the rise and progress of articulate expression of which it is but one mode. In fact, we may define laughter as articulate merriment. At any rate, in a very broad but real sense, the hearty laughter of a civilized human adult may be termed articulate in comparison with animal and infantile expressions. If this be a real clew we should expect that those savage tribes whose language is largely composed of clicks, will have little capacity for laughing of the European type. That is a point which is worth looking into, and the whole subject of race and language as bearing on laughter is yet to be explored in any thorough manner. The method of



laughter with the deaf and dumb should also be studied. The growth of laughter in relation to articulate expression in general in infants must also be thoroughly investigated. It seems probable that laughter is an articulate development from the shout or crow of pleasure, and sobbing likewise from the scream and howl of pain. An indication of this is that in the height of pleasure and pain, when we might expect expression to revert to primitive form, laughing often ends in shouts, and sobbing in agonized wailing. Further, Mr. W. S. Landor observed that on occasions when a European would laugh, an Ainu would be apt to shout with pleasure. Thus, laughter may be considered a reduplicated and articulated shouting. Laughter, once established as a mode of pleasure expressions, expresses tickling. However, the better position is that tickling pleasure as reminiscent of ancestral play is expressed articulately in man by laughter as the original mode, other forms being later. Again, as a cause of laughter, we may suggest that the tickling stimulates and sets up violent motor response, as in the joyous play activities of chasing and fleeing, but when this external response, as running, is not carried out, this tickling cumulates the internal response in lung actions, diaphragm, etc. Laughter is a panting. In short, the organism reacts like a "racing" engine.

It is interesting to note that the laughable does not equal the pleasurable, that laughter has not come to be expression for pleasure in general, but only for certain kinds of pleasure, and those rather slight and frivolous. The strongest and most exciting amusements, as horse-racing, football, prize-fighting, induce the keenest pleasure in skill and in the joy of success in combat and competition—under conditions of the struggle of existence this joy of successful conflict being by the very nature of evolution the greatest and deepest—and yet laughter is not found here. Laughter is essentially a minor affair and implies a certain careless objectivity as opposed to vital subjective interest. So duplicity is not laughable in matters of the highest import. Military strategy does not excite laughter, but the strategy of a negro in robbing a hen-roost may seem highly laughable. All which points to the conclusion that laughing is born of play, and is mainly and fundamentally playful throughout its whole evolution even to the latest forms of mental play.

As to the method of investigation, the *questionnaire* mode of popular reports is evidently a crude and very tentative form. This method is scarcely used by any science but psychology; biology, physics and other sciences collect their facts not from general observations sent in by the untrained or half-trained observers, but wholly by the direct studies of expert

scientific observers. A geological or geographical explorer can depend but little on the reports of the natives. The science of mind is certainly not less difficult than others, and as common sense fails elsewhere, so also here. Science in all directions is the correcting of common sense by deepest insight unaffected by ordinary utility. Hence, if the *questionnaire* method is worth working at all, it is only as a bare preliminary, simply as pointing out salient points for research. To secure any results of high value on the psychology of laughter would require the continuous service of several thoroughly trained and able psychologists who should work independently for several years and publish independent monographs. These men should be good physiologists, and should have a decided *penchant* for their work, and above all, have acute psychological insight in quickly and accurately realizing the states of mind implied by the most various activities. Their studies should be chiefly directed not upon observation of the very complex phenomena of laughter in civilized adults, but in the study of the evolution of laughter with infants and savages. Combined phonographic-photographic records of evolution of laughter with infants would be valuable. Pure savagery is fast fading from the globe, and the most pressing need for evolutionary psychology to-day, is a thorough study of the savage by psychologists of really eminent insight. Various scientific associations, biologic and others, send explorers and collectors to all parts of the earth, and it is high time that psychological associations do the same, and also provide a psychologist to go with all general scientific expeditions.

## PSYCHOLOGICAL LITERATURE.

- (26) *Christianity and Idealism*. By JOHN WATSON, LL. D. The MacMillan Co., 1897. Price \$1.25.

This is a new and revised edition of Professor Watson's book, which first appeared a little less than a year ago. Several additions have been made to Part II. They include chapters on "The Failure of Materialism," "The Idealistic Interpretation of Natural Evolution," "Idealism and Human Progress," besides a dozen new pages in the final chapter, in which the author supplements his view of the relation of the human to the divine intelligence. The inadequacy of a mechanical metaphysic is shown in the chapter on materialism. Evolutionalism as a philosophical principle succeeds better, for it explains the world as a rational unity. This unity is variously expressed in gravitation, chemical affinity, biological organism, and finally in the personal self. The chapter on human progress asks what is implied in this highest unity — the personal self. The answer asserts that the whole process of human evolution consists in "the gradual realization of reason in the individual and in society." Yet, this is no manifestation of a process hostile to the "cosmic" process, as Professor Huxley contended, nor is it antithetic with a "religious feeling," which Mr. Kidd makes responsible for human progress. It is rather the self-conscious and self-determining principle which explains the lower as well as the higher stages of evolution — the "ultimate conception by means of which existence must be explained." The book certainly gains in interest and value by the introduction of the concept of evolution into the service of idealistic philosophy.

I. MADISON BENTLEY,  
Cornell University.

- (27) *Sull' Importanza delle Ricerche relative alla Storia delle Scienze*. DOTT. GIOVANNI VAILATI. Torino, 1897, 22 pp. 8vo.

This introductory lecture to a course on the history of mechanics emphasizes the need and the value of researches into the history of human thought, as seen in the development of the various branches of science. Dr. Vailati compares the disdain with which certain Greek philosophical schools looked upon such researches with the position of Malebranche, and those who held the Scriptures to contain all knowledge, and Adam to have been all perfect before the fall. The history of human opinions, bad or good, false or true, old or new, is of paramount importance. Every error indicates some reef to be avoided, though every discovery does not always indicate a path to be followed. The "science" of times gone by is as human as the science of the century in which we now are. From the knowledge of the development of science comes a true concept of the evolving human mind. Philogeny and ontogeny receive light from such investigations. Their pedagogical value is also very high. As scientist, to use the noble phrase, one can belong "to the masters of those who know," but as teacher, he must be "the masters of those who know not." Dr. Vailati points out that at the University of Berlin there are courses in the history of chemistry and of medicine; at Breslau, in the history of medicine, of mathematics and of botany; at Königsberg, in the history of astronomy; at Graz, in the history of ancient Greek scientific literature; at Wit-

tenberg a special course in the history of chemistry, and at Tübingen, Bonn, Vienna and Turin, courses in the history of medicine. At Vienna, too, Dr. Mach gave a course on the history of the mechanical theory of heat.

- (28) *Il Principio dei Lavori Virtuali da Aristotele a Erone d'Alessandria*. Nota del DOTT. GIOVANNI VAILATI. Torino, 1897, 25 pp. 8vo.

This reprint from the "Proceedings of the Royal Academy of Turin" sketches briefly the history of the principle of energy from Aristotle down to Hero of Alexandria—the mechanical questions of the former and the elevator of the latter being treated in some detail.

- (29) *Il Tempo di Reazione semplice studiato in rapporto colla curva pletismografica cerebrale*. PROF. M. L. PATRIZI. Reggio-Emilia, 1897, 15 pp. 8vo.

This article, reprinted from the *Rivista Sperimentale di Freniatria*, treats of simple reaction time in relation to the cerebral plethysmographic curve. The subject was Emanuele Favre, a boy of 13, a breach in whose cranium made such observations possible. The medium of 126 reactions for stimuli (auditory) when there was great cerebral volume was 332.5σ, when less (116 reactions), 345σ. The author concludes that (1) the oscillations of the specific activity of the cerebral cells and that of the circulation in the brain follow each its own course; (2) the strength of attention manifests itself with a greater rapidity of reaction times, and with a greater regularity of the psychometric curve, together with minor inequalities in the plethysmographic curve of the brain.

- (30) *I Reflessi Vascolari nelle Membra e nel Cervello dell'uomo per vari Stimoli e per varie condizioni fisiologiche e sperimentali*. PROF. M. L. PATRIZI. Reggio-Emilia, 1897, 85 pp. 8vo.

This detailed study, reprinted from the *Rivista Sperimentale di Freniatria*, is well furnished with curves and tables. The subjects were two boys of 13, Emanuele Favre at Turin and Edoardo Pardini at Sassari, the experiments extending over parts of two years, 1895-1896.

The author's conclusions are: (1) The vascular reflexes in man follow the fundamental laws of localization and irradiation, noted for the reflexes of relational life; (2) the localized vascular reflex takes place in less time than the radiated vascular reflex; (3) the brain exercises a clear influence on the activity of the spinal marrow, even in regard to the reflex movements of the blood vessels; (4) the time of vasal reflection in waking (for sensitive stimuli) is for the arm about 3", for the leg at about 5"; (5) the vascular reflex of the brain (for sensorial stimuli) has a latency not less than the brachial reflex for the same stimulus; (6) sleep induces a great retardation in the time of vasal reflection, diminishing from the brain to the arm, and inappreciable in the vessels of the lower limb; (7) the blood movements of the brain in sleep, consequent on stimuli, are, doubtless, active and autonomous reflexes; (8) the vascular reflex in the limbs for sensorial stimuli and psychic stimuli takes place in a time (4" in the arm) longer than the reflex for sensitive stimuli; (9) there is a vascular reaction for each sense stimulated; (10) some sensorial stimuli have greater capacity than others for provoking vasomotor reactions.

- (31) *La Terre champ de l'activité humaine*. M. L. GALLOUÉDEC. *Rev. Scientif.* (Paris), 4<sup>e</sup> Série, Tome VIII (1897), pp. 262-271.

An interesting study of the relation of man to the planet on which he dwells, treating from a French point of view some of the questions discussed by Dr. W. J. McGee in his pamphlet, "Earth, the Home of Man," published in 1894. The influences of relief, situation, soil, climate, are touched up, and the great variation in the value of these factors in the course of human history emphasized. Man first conquered the hill-sides, then the plains, and now bogs and morasses, and even the loftiest mountains are yielding to his skilful attacks.

- (32) *Des conditions d'Arrêt ou d'Avortement de groupes humains*. M. F. SCHRADER. *Ibid.*, pp. 38-44.

According to the author, all changes, nothing is fixed—fauna, flora, customs, habits, civilizations, all pass away. The idea of nineteenth-century peoples that their civilization is stable, is fixed, will endure, is an illusion. Bordeaux will die when vineyards are no more in France. Spain died as lord of the Indies long ago. Egypt, as Herodotus said, is a "gift of the Nile." The cliff dwellers tell a tale of ease and comfort long disused. The Negritos of the Philippines, the Ainos of Japan, the Eskimo, the Lapps, the Bushmen, have all been driven to the wall. But some have their revenges. Resurging through the Spanish strata the old Aztec rules Mexico—in Chili, Peru, Brazil, the redskin's face appears again. It seems impossible entirely to suppress a people, a race. The survival of the fittest takes place even here. They persist who are sons of the soil and of the sun. The force of things makes them to be born again.

- (33) *Les Lois phoniques*. M. MICHEL BRÉAL. *Ibid.*, pp. 34-38.

Phonetic laws are neither fatal nor blind, says the distinguished linguist of the academy. Phonetic changes start from one individual, and unless they are welcomed, remain without effect and are soon forgotten. The practical study of phonetics, inaugurated by Gaston Paris, and since pursued with the aid of the phonograph and other instruments, has done much to re-orient us on the question concerning which the older authorities spoke so confidently.

- (34) *Le Transformisme et son interpretation en Crâniologie*. M. G. PAPILLAUT. *Ibid.*, pp. 392.

The persistence of the medio-frontal suture in the skull, *e. g.*, of modern Parisians, and the existence of certain peculiarities in the region of the obelion, concerning which the author has written at greater length elsewhere, are manifestations of a progress, not a regression to an ancestral state, though they may be reckoned among the cases of atavism. The correlation of the metopic suture with intelligence is an interesting point.

- (35) *L'Inanition du noyau cellulaire*. S. M. LOUKIANOW. *Ibid.*, pp. 513-519.

The author gives some account of experiments from which he concludes that the cell nucleus as well as the body, are diminished by complete or incomplete nucleus, a diminution subject to particular laws. The cell nucleus therefore have a biological autonomy of their own. M. Loukianow thinks that our one great gift to the biology of the twentieth century will be not proof of the simplicity of the cell, but of its organic complexity.

- (36) *La fonction du Cerveau*. CHARLES RICHEL. *Ibid.*, pp. 641-649.

The brain alone, of all the organs of the body, has consciousness and intelligence. The brain is the organ of the past, the medulla the organ of the present. In a word the brain is a memory apparatus.

- (37) *Les conquêtes de la Psychiatrie*. CÉSARE LOMBROSO. *Ibid.*, pp. 577-583.

The author notes some of the recent discoveries of psychiatry, "the new Prometheus, which is seeking to snatch away the secret of the nature of human thought." The study of the man of genius, the savage, the idiot, the child, reveals much of the complicated as well as the simple workings of thought. Hysterics, epilepsy, hypnotism, sleep, dreams, automatisms, psychic reactions, all bring their quota to the recognition of types and characteristic modes and degenerations of thought and action, to the understanding of the parallel between the phenomena of ideation (the highest and the least under control) and those of sensation (the humbler and most controllable). The conclusion of it all is the rather pessimistic view that "we live in the false, for the false, with the false; the true is only met with exceptionally in the world." Of the great mass of men in the world it may be said *fruges consumere nati*; the slave of habits, words, sounds even, they sacrifice to these the idea, and oppose research, discovery, truth, science. By sacrifice and suffering alone have great revolutions been accomplished.

- (38) *Y a-t-il des Nerfs spéciaux pour la Douleur?* PH. TISSIÉ. *Ibid.*, pp. 402-404.

The author states his agreement with the pain-centre theory of Richet, put forward in criticism of the views of M. Frédéricq, published last year.

- (39) *Zur Katatonie-Frage*. Eine klinische Studie. Von SCHÜLE (Illenau). *Allg. Ztschr. Psych.* Berlin, LIV Bd. (1897), S. 515-552.

An extended criticism of the view, first fully set forth by Kahlbaum in 1873, that katatonia was a special clinical form of disease. After examination of the katatonic phenomena, the author concludes that the clinically independent status of the affection has not yet been made out—much less the idea of "a katatonic motility-nemosis." It is merely a "gathered-up" name, a heuristic appellation for the most diverse motor stimulation and inhibition symptoms.

- (40) *Zur Pathologie der Epilepsie*. DR. MED. N. KRAINSKY. *Ibid.*, 612-665.

The general results of the extended experiments of Dr. Krainsky of Charkow seem to indicate that the blood is the carrier of the epileptic poison. The author made special investigations of the chemical nature of the reactions obtained.

- (41) *Die Hypothese der spezifischen Nervenzellenfunction*. DR. FRANZ NISSEL. *Ibid.*, S. 1-107.

This is an elaboration of the address delivered before the annual meeting of German psychiatrists at Heidelberg in September, 1896. More than 60 pages are taken up with the explanation in detail of the four plates (eight figures), by which the article is accompanied, and other illustrations not there given.



- (42) *Acute Manie.* DR. M. J. VAN ERP TAALMAN KIP. *Ibid.*, S. 119-135.

From investigation of 856 patients (men 413, women 443), in the asylum at Dordrecht, the author doubts the correctness and the desirability of the term "acute mania," as well as its independent existence. "Periodic madness" is better.

- (43) *Ist die progressive Paralyse aus den mikroskopischen Befunden an der Grosshirnrinde pathologisch-anatomisch diagnosticirbar?* Eine literarische und anatomische Studie. DR. OTTOMAR SCHMIDT. *Ibid.*, 178-207.

After a careful review of the literature of the subject, Dr. Schmidt of Würzburg says that safe, convincing pathological diagnoses of progressive paralysis are still too much lacking to justify dogmatism.

- (44) *Ueber die Pathogenese des Delirium Tremens.* DR. J. E. JACOBSON. *Ibid.*, S. 221-270.

Based upon the study of 300 cases of *delirium tremens* personally investigated concludes that "the toxic plus" is not the real deeper cause of the delirium outbreak; the latter is to be found in the chronic alcoholization of the brain.

- (45) *Physiologische Genese der Paranoia.* DR. LUIGI RONCORONI. *Ibid.*, S. 336-372.

From examination of the literature and personal investigation of 100 cases (men 80, women 20), Dr. Roncoroni of Turin comes to the conclusion that genuine paranoia belongs to the first group of paraphrenias without automatic influencing of motility, induced essentially by abnormal hereditary constitution of the psychic functions, which may lead on purely parapsychological grounds to the development of the psychosis. Genius is often in touch with both the genuine and the rudimentary paranoia. But genius never is tied down to a single form of psychosis and congenital forms preponderate with it.

- (46) *Théorie des Emotions.* JULES SOURY. *Ann. Méd.-psychol.* Paris, VIII<sup>e</sup> Série, Tome VI (1897), pp. 247-262.

In reviewing recent studies of blushing (Pitres and Régis, von Bechterew, etc.) and less recent general discussions by James, Lange, Sergi, Marillier, Kraepelin, Wernicke and others, the author concludes as follows: The mechanism of the muscular, articular, tendinous, cutaneous, etc.; consciousness, that of the notion of position and of innervation of the different parts of the body, of the state of the circulation, respiration, secretions and excretions, appears to be in all points identical with the mechanism of the consciousness of moral and intellectual emotions. In both cases we have only to do with a kinæsthesia of the organic modifications provoked by excitations of the internal or the external milieu and transmitted to the central nervous system. A. F. CHAMBERLAIN.

#### BOOK NOTES.<sup>1</sup>

(G. S. H.)

- (47) *Grundlegung der Neusokratischen Philosophie.* Von DR. HEINRICH GOMPERZ. Leipzig, 1897.

The new Socratic school of religious faith was founded in 1890 by Leo Haas. It is a community whose creed is the Socratic faith that "no evil can befall a good man living or dead." This belief rests on

<sup>1</sup> Notice in this section does not preclude fuller review later.



no facts or arguments, but is firm, subjective, eternal, supermundane.

Mr. Gomperz' purpose here is, nevertheless, to show that this faith corresponds with the latest results of science, and to make propaganda. This conviction gives a feeling of independence, was the life principle of the great sage, has its correlate in the idea that all virtue is in knowledge. What has real worth in us is indestructible, and this is *Gemüth* understanding and character, which are the three elements of personality. This resists and negates evil. Three ways lead to the paidia or free and joyous activity, viz.: right thinking, willing and feeling. This state gives an imperturbability for which the world seems a divine comedy. Evil is only to be overcome and good only to overcome it.

- (48) *Ueber die Raumwahrnehmungen des Tastsinnes, ein Beitrag zur experimentellen Psychologie.* Von DR. VICTOR HENRI. Berlin, 1898, pp. 228.

We have here at last a comprehensive work on the dermal space sense with a bibliography of 322 titles, based on a broad historical knowledge, and making important new experimental contributions to the subject.

Part I is devoted to a gathering of the facts (a) of dermal space sense generally, (b) localization of tactile impressions, (c) physiological and pathological facts. Part II continues a presentation and discussion of theories (a) touching the origin and development of the spatial element, nativistic and genetic, (b) biologic-psychological sketch of the spatial perception of touch.

- (49) *Magic, Stage Illusions and Scientific Diversions, including Trick Photography.* Compiled and edited by Albert A. Hopkins, with an introduction by H. R. EVANS. 400 illustrations. Munn & Co., publishers, New York. pp. 556.

At last we have a really valuable treatise on sleight of hand, prestidigitation, with explanations and a copious bibliography. The volume is almost elegantly gotten up and will prove a mine of both suggestiveness and illustrations for empirical psychologists. The topics best treated are stage disappearances, optical tricks, conjuring, juggling, fire-eating, sword tricks, ventriloquism, animated puppets, shadowgraphy, ancient magic, stage effects and modern stage and theatre secrets, curious toys, etc. Although the order of topics is open to criticism, the book is the product of long and careful compilatory study by a real lover of the topic, who knew Heller and many other magicians, and who intersperses his pages with many personal reminiscences.

- (50) *Karl Ernst von Baer und seine Weltanschauung.* Von DR. REMIGIUS STÖLZLE. Regensburg, 1897, pp. 687.

This Würzburg professor of philosophy writes the life of the great founder of modern embryology in systematic wise, treating in order the sources of Baer's view of the world and his relation to philosophy and the theory of knowledge, the problem of cosmology, biology, anthropology, religious philosophy, philosophy of history, ethics, pedagogy and politics. The range of Baer's thought is amazing, and he is fortunate in his biographer.

- (51) *Problems of Nature.* By GUSTAV JAEGER. New York, 1897, pp. 261.

The "researches and discoveries" of the well-known author, not only of the Jaeger costume, but of the smell theory of the soul, are here selected from his published writings and translated in fourteen

short zoölogical and twenty-eight anthropological papers, with four "varia," in Part III. An autograph letter of Darwin to the author is re-produced in fac-simile, expressing the "highest degree" of interest. In essays of three or four pages each, the author summarily states the organs of life, the origin of species, inheritance, the animal soul, infection, spirit and intellect, the origin of language, and many other theories of greatest interest. The author is bold and often stimulating and novel, but seems to me very superficial and unread in his field.

- (52) *Zur Psychologie der Frau. Erstes Theil.* LAURA MAHRHOLM. Berlin, 1897, pp. 355.

This is the first book by a woman on the psychology of her sex. Catholic women have a closer connection with nature and a wider sphere of emotional expression than Protestant women. Their work is social and a sexual psychology of woman will follow. The period of thought has lasted 400 years, but a period of feeling is at hand, and with this will come the day of woman. She represents the instinct-feelings. The book is both brilliant and suggestive.

- (53) *Wagner's Ring of the Nibelung and the Conditions of Ideal Manhood.* By DAVID IRVINE. London, 1897, pp. 281.

Wagner said this contained his entire view of the world, and that it was essentially at variance with established conceptions. He is like Browning in the bitterness of his enemies, and the ardor and activity of his apologists. The deeper we go the better we understand the Ring. It treats the great problem of renunciation. Conscientiousness exists to show us the needs of our common nature and how we may conform to it. Only music can fully reveal even to feeling the profound significance of Wotan's tragic abdication. To hold that a state lives solely on the vices of society, and that the only monopoly any church can claim is that of its errors, for the truth is common to all, suggest's Wagner's motto, "Destroy, yet redeem." In the twilight of the gods, the new man of the future is born.

- (54) *Vocabulaire de L'Angelologie.* Par MOISE SCHWAB. Paris, 1897, pp. 318.

This is a dictionary of angels, demons and other spiritual beings, based on 1,300 Hebrew manuscripts (mostly before the eighth century) in the *Bibliothèque Nationale*, extracted from memoirs presented by various savants of the Academy of Inscription and Belles-Lettres. The Cabalistic demonology reflects very different grades of intelligence, and many of the terms are ungrammatical and unlogical. The angels form ten degrees and are often also allegorical. Both together personify every human faculty and passion, vice and weakness, are in every ray of light, whirlwinds of dust, etc. Stars are sylph-like dreams in gnome-like nightmares, and many are personified as Gabriel, Michael, Raphael and Sabaoth. They were invoked by many conjuration formulæ, and the letters of the names were full of symbolism, and names and letters subjected to many forms of permutation and combination. In all there are over 3,000 of these terms.

- (55) *Folie des Femmes Enceintes, etc.* Par DR. A. PARIS. Paris, 1897, pp. 131.

A brief hand-book including the history of the subject, typical clinical cases, cause, symptoms and treatment.

- (56) *Zur Geschichte des Entwicklungsbegriffs.* Von DR. L. MARIN-POLSKY. Berne, 1897, pp. 120.

This memoir is in the series of studies in philosophy and its history edited by L. Stein, and now in its sixth volume. Evolution begins with Heraclitus. Then follow the stoics, Telesius, Bruno, Hobbes, and with the latter the truly scientific treatment of the problem of evolution begins.

- (57) *The Development of the Frog's Egg.* An Introduction to Experimental Embryology. By THOMAS HUNT MORGAN, Ph. D., Prof. of Biol., Bryn-Mawr College. N. Y., Macmillan Co., 1897, pp. 192.

The author attempts to give a continuous account of the development of the frog's egg from the time when it is first forming to the moment when the young tadpole emerges from the jelly-membranes, and to bring together the most important results of studies bearing on the topic. Special emphasis is laid on the results of experimental work in the belief that the evidence from this source is the most instructive. The work suggests Wilson's valuable memoir on the cell and treats similar topics.

- (58) *Die Historische Entwicklung des Experimentellen Gehirn und Rückenmarks - physiologie vor Flouriens.* Von DR. MAX NEUBURGER. Stuttgart, 1897, pp. 356.

The first part of this work is devoted to Willis, the second to Haller and his contemporaries, and the third to Magendie, Bell and Flouriens.

- (59) *Sur la Génération de la Voix et du Timbre.* Paris, 1897, pp. 392.

The author declares that since Helmholtz we have been living under a delusion which has checked all progress, and offers a new aerodynamic theory of acoustics in place of his. Little mono and di-clonal anticyclones cause sound and the tympanum originates timbre.

- (60) *Essai sur les conditions et les limites de la certitude logique.* Par G. MILHAUD. F. Alcan, Paris, 1898, pp. 203.

Part I treats the conditions of logical contradiction, Part II the conditions of logical certitude in mathematics, both pure and applied; Part III, special problems illustrating the principle of contradiction; viz., liberty and mechanism, non-Euclidean geometry, Kant's Mathematical Antimonies. The book is an argument that we must renounce logical certitudes in the domain of reality.

- (61) *Comment naissent les mythes.* Par PAUL REGNAUD. Paris, 1898, pp. 251.

This little work is a detailed and interesting attempt by a distinguished Sanscrit expert to prove that all Indo-European mythology originates in verbal substitutions and personifications. This thesis is illustrated at length in three mythic themes: e. g., the Vedic sources of Petit Poucet, the Hindu legend of the deluge and Pusuravas and Urvaca.

- (62) *Problèmes d'Esthétique et de Morale.* Par C. R. C. HERREM-RACH. F. Alcan, Paris, 1898, pp. 163.

The beautiful, sublime, tragic and comic each have a circa twenty-page chapter, and the rest of the volume describes the evo-

lution of moral sentiments, motives of conduct, and the relations between ethics and sociology. The author is a professor in a Dutch Lycée, and writes in a style of unusual elegance.

- (63) *La Personne Humaine*. Par L'ABBÉ C. PIAT. F. Alcan, Paris, 1897, pp. 404.

In Book I, Perception, the author enumerates and criticises the data of consciousness and of science. Book II discusses whether reflection is a result of an organic process, commences in instinct and appears in the language of animals. Book III treats of responsibility in its relation to science, conscience and reason. In fine, human personality is something more than a synthesis of conscious and sub-conscious states; phenomenism will not suffice. A higher synthesis of all the facts of personality is needed. Man should wish to be not merely a person, but to be the species.

- (64) *In Search of a Soul*. By HORATIO W. DRESSER. Boston, 1897, pp. 273.

This is a series of essays on interpretation of the higher nature of man, and discusses the reality of the soul, absolute and higher self, reincarnation and karma, spiritual force, soul, etc., from the standpoint of what may be called the higher Christian science.

- (65) *Etudes d'histoire de la philosophie*. Par EMILE BOUTROUX. F. Alcan, Paris, 1897, pp. 443.

This accomplished professor of letters at the Sorbonne here prints seven of his best papers, *v. g.*: Socrates as founder of moral science, Aristotle, Jacob Boehme, Descartes, The Relation of Morals and Philosophy in his System, Kant, and The Influence of Scotch upon French Philosophy.

- (66) *Théories Modernes sur les Origines de la Famille de la Société et de l'état*. Par A. POSADA. Paris, 1896.

This work translated from the Spanish is a convenient and able summary, and discusses the theories of Maine, Sumner, Bachofen, McLennan, Morgan, Lubbock, Giraud-Teulon, Starckes, Spencer, Coulanges and Iuring. Political society is first and the family develops with, but under it.

## NOTES AND NEWS.

Dr. W. H. R. Rivers of St. John's College has been appointed to the recently-established university lectureship in experimental psychology at the University of Cambridge. Dr. Rivers has given courses in sense physiology and reaction-work at Cambridge and at University College, London, for some years past. He has published several studies in optics and (in conjunction with Professor Kraepelin) has written upon the question of mental fatigue.

We have received the first few numbers of a new fortnightly, the *Intermédiaire des Biologistes*, edited by Mm. Binet and Henri, with the assistance of a large corps of French and foreign biologists. The publication forms a sort of "Notes and Queries" in the biological realm. Psychology figures largely in its pages, and the names of Baldwin, Bechterew, Ebbinghaus, Forel and G. E. Müller occur in the list of collaborators. The *Intermédiaire* promises to be of great service to psychologists, and especially to those of the experimental school.

Professor Titchener's *Primer of Psychology* will appear in January. It follows the experimental method throughout, and gives full directions to teachers for procuring apparatus and materials.

Dr. A. Allin succeeds Professor Russell in the chair of psychology and pedagogy at Colorado University. Dr. F. Kennedy has been made demonstrator in experimental psychology at Princeton University.

Professor Baldwin's presidential address at the Cornell meeting of the American Psychological Association dealt with the topic of "Selective Thinking." It was an amplification of the treatment of the same subject in the speaker's "Social and Ethical Interpretations in Mental Development."

The Cornell laboratory has recently acquired a new room, 9x22 feet, which will be devoted exclusively to experiments upon the senses of smell and taste. The laboratory now possesses ten rooms.

### BOOKS RECEIVED.

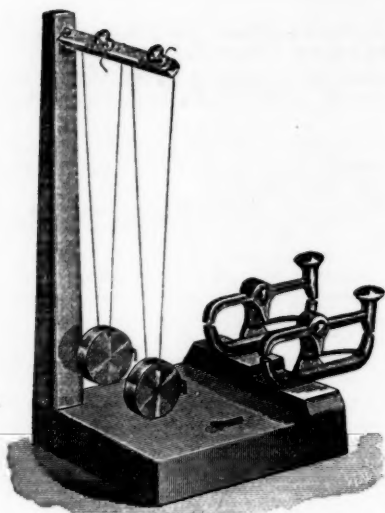
ALLEN, GRANT. *The Evolution of the Idea of God; an Inquiry Into the Origins of Religion.* Henry Holt & Co., New York., pp. x-447. Price, \$3.00.

BLONDEAU, CYRILLE. *L'absolu et sa loi constitutive.* F. Alcan, Paris, 1897, pp. 350. Price, Fcs. 6.

CORNELIUS, HANS. *Psychologie als Erfahrungswissenschaft*, pp. xv-445. B. G. Teubner, Leipzig, 1897. Mk. 10.

LE DANTEC, F. *L'Individualité et l'erreur individualiste.* F. Alcan, Paris, 1898, pp. 175. Price, Fcs. 2.50.

- FULLIQUET, GEORGES. *Essai sur l'obligation morale*. F. Alcan, Paris, 1898, pp. 454. Price, Fcs. 7.50.
- GOMPERZ, HEINRICH. *Grundlegung der Neusokratischen Philosophie*, pp. ix-154. Franz Deuticke, Leipzig u. Wien, 1897. Paper, M. 2.50.
- MACH, ERNST. *Popular Scientific Lectures*. Translated by Thomas J. McCormack. Open Court Pub. Co., Chicago, 1897, pp. 382. Price, \$1.
- MALAPERT, PAULIN. *Les éléments du caractère et leurs lois de combinaison*. F. Alcan, Paris, 1897, pp. 302. Price, Fcs. 5.
- MANACÉINE, MARIE DE. *Sleep: Its physiology, pathology, hygiene, and psychology*, pp. vii-341 (*Contemporary Science Series*), Charles Scribner's Sons, New York, 1897. Price, \$1.25.
- MASON, R. OSGOOD. *Telepathy and the Subliminal Self*. An account of recent investigations regarding hypnotism, automatism, dreams, phantasms, and related phenomena. Henry Holt & Co., New York, pp. viii-343. Price, \$1.50.
- MILHAUD, G. *Essai sur les conditions et les limites de la certitude logique*, pp. viii-203. F. Alcan, Paris, 1898. Price, Fcs. 2.50.
- MÜLLER, RUDOLF. *Naturwissenschaftliche Seelenforschung*. I. *Das Veränderungsgesetz*. Arwed Strauch, Leipzig, pp. viii-168. 20 Bogen, M. 5.
- NIETZSCHE, FRIEDRICH. *The Works of*. Edited by Alexander Tille. Vol. X, *A Genealogy of Morals*, translated by William A. Hausmann. Poems, translated by John Gray. The Macmillan Co., New York, 1897, pp. xix-289. Price, \$2.
- PIAT, C. *La Personne Humaine*, pp. 404. F. Alcan, Paris, 1897. Price, Fcs. 7.50.
- PILLON, F. *La Philosophie de Charles Secrétan*. F. Alcan, Paris, 1898. pp. 197. Price, Fcs. 2.50.
- PODMORE, FRANK. *Studies in Psychical Research*, pp. ix-458. G. P. Putnam's Sons, N. Y. City, 1897. Price, \$2.00.
- PRÉAUBERT, E. *La Vie, Mode de Mouvement*. *Essai d'une théorie physique des phénomènes vitaux*, pp. 310. F. Alcan, Paris, 1897. Fcs. 5.
- REGNAUD, PAUL. *Comment Naissent les Mythes*, pp. xx-249. F. Alcan, Paris, 1898. Fcs. 2.50.
- DE STRADA, J. *Ultimum Organum*. *Constitution scientifique de la méthode générale*. Nouvelle édition. 2 vols., pp. 387, 484. F. Alcan, Paris, 1897. Price, Fcs. 7.
- VINCENT, GEORGE EDGAR. *The Social Mind and Education*. Macmillan Co., N. Y., 1897, pp. 155. Price, \$1.25.



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